JAMAICA

ANNUAL REPORT

OF THE

Department of Science and Agriculture

FOR THE

YEAR ENDED 31ST DECEMBER, 1936.

Ordered by His Excellency the Governor to be Printed.

IMPERIAL MYCOLOGICAL
19 APR. 1938
INSTITUTE

JAMAICA
GOVERNMENT PRINTING OFFICE, KINGSTON.

1937.

CORRIGENDA.

Page 3, line 11.
For "page 79, Appendix No. 1"
read "page 91, Appendix No. 4".

Page 41, 6th line from foot of page.
For "During the year"
read "Towards the end of the year 1935."

Page 47, 9th line from foot of page.
Add "(See p. 91, Appendix No. 4)."

JAMAICAN EXHIBITS AT THE BRITISH INDUSTRIES FAIR AND THE IMPERIAL FRUIT SHOW IN LONDON.

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Head Office.

Chief Clerk and Personal Assistant to the Director of Agriculture	George D. Goode, Dip. Agr.
Accountant	N. B. Donaldson.
Second Class Clerks	R. A. White, R. S. Nelson
Librarian	Miss E. Marson
Assistants, Typists and Stenographers, and Temporary Clerks	Miss I. R. Mein, Miss V. M. Barrows, Miss R. E. White, Mrs. M. Barrett, Miss D. Wyatt, K. A. Wilson.

Public Gardens.

Superintendent and Plant Breeder	M. S. Goodman
Horticulturist	E. J. Downes
Assistant	Miss E. G. McKay.

Agricultural Experiments, Education and Field Services.

Agricultural Superintendent	R. S. Martinez, Dip. Agr.
Superintendent Sugar Cane Experiments	M. S. Goodman.
Agricultural Officer	L. L. Carrington, Dip. Agr.
Junior Agricultural Officers	H. C. Miller, D. I.C.T.A. J. McEwen, D.I.C.T.A. E. A. Tai, D.I.C.T.A. R. C. Bridge
Tobacco Specialist	F. W. Winckley
Headmaster Farm School	J. W. Howe, B.S.A., M.Sc.
Assistant Masters	L. A. Powell, H. C. Virtue, V. A. Valentine
Agricultural Superintendent Grove Place Stud Farm and Experimental Station	A. F. Thelwell
Supervising Inspector of Plant Diseases	J. B. Sutherland
Inspectors of Plant Diseases	19 Inspectors.

Live Stock.

Senior Veterinary Officer	S. Lockett, V.M.D.
Technical Assistant	W. F. Hutchison.
Superintendent Hope Stock Farm	J. W. Howe, B.S.A., M.Sc.
Foremen Hope Stock Farm	G. E. Redshaw, R.A. Amiel
Clerk & Storekeeper Hope Stock Farm	L. S. Marston
Superintendent of Stock Grove Place Stud Farm	E. U. Lewis
Clerk Grove Place Stud Farm	R. N. Lewis.

Research and Laboratories.

Deputy Island Chemist	W. L. Barnett, M.A., B.Sc., F.I.C.
Plant Pathologist	F. E. V. Smith, B.Sc.
Entomologist	W. H. Edwards, D.I.C., F.E.S.
Agricultural Chemist	H. H. Croucher, B.Sc.
Botanist	L. N. H. Larter, B.Sc., A.R.C.S., A.I.C.T.A.
Assistant Chemist	E. N. Richards.
Temporary Assistant to Agricultural Chemist	W. K. Mitchell, D.I.C.T.A.
Techinical Assistants	E. K. P. Blake, O. W. Harrison, D. C. Davies, W. B. Dixon, Z. A. Daniels, D. A. L. Segre, J. H. Haughton, G. A. Little, R. D. Hill, L. E. Thwaites, K. A. Gayle,
Clerk & Storekeeper	L. A. Boothe.

Produce Protection.

Chief Inspector of Produce	P. W. Murray.
Inspectors of Produce	H. G. Coote, R. C. Somerville, A. M. Douet, H. B. Monteith, I. H. Campbell, C. M. G. Purchas.
Secretary	Miss U. E. Foster-Davis.
Typist & Stenographer	Miss C. D. Levy.

Low Temperature and Marketing Station.

Officer in Charge	F. E. V. Smith, B.Sc.
Agricultural Officers	J. McEwen, D.I.C.T.A. H. C. Miller, D.I.C.T.A., E. A. Tai, D.I.C.T.A., R. C. Bridge.
Technical Assistant	Z. A. Daniels.
Field Assistant	M. B. Baker.
Accountant	W. W. Woolcock.
Typist & Stenographer	Mrs. B. Vernon.

DEPARTMENT OF SCIENCE AND AGRICULTURE.

Report for the Year ended 31st December, 1936.

SECTION I.—AGRICULTURE IN THE COLONY.

A. General.

The following staff changes took place during the year:—

New Appointments—

Mr. R. S. Nelson, Assistant in the General Post Office was appointed a Second Class Clerk and transferred to this Department.

Mr. F. W. Winckley was appointed Tobacco Specialist.

Mr. W. K. Mitchell, a graduate of the Imperial College of Tropical Agriculture was appointed Temporary Assistant to the Agricultural Chemist.

Mr. W. W. Woolcock was appointed Accountant at the Low Temperature and Marketing Station

Messrs. L. E. Thwaites and K. A. Gayle were appointed Technical Assistants.

Promotions.—Mr. R. C. Bridge, Technical Assistant, was promoted a Junior Agricultural Officer. Messrs. J. H. Haughton and G. A. Little, Apprentices, were promoted Technical Assistants.

Transfer.—Mr. W. E. Watson, who served as a Clerk in the Head Office since 1916, was promoted in May and transferred to the Lunatic Asylum as Clerk and Purveyor.

Retirement.—Mrs. M. Barrett resigned her appointment as an Assistant at the end of the year.

Leave.—During the year the following officers were absent on leave:—

Head Office—	
Mr. G. D. Goode, Chief Clerk	From 29th Sept. to 28th December
Miss V. M. Barrows, Typist and Stenographer	From 20th July to 13th September.
Miss R. E. White, Typist and Stenographer	From 8th June to 19th July
Government Laboratory—	
Mr. W. L. Barnett, Deputy Island Chemist	From 1st July to 19th Jan., 1937
Mr. W. H. Edwards, Entomologist	From 12th March to 26th October
Mr. R. S. Martinez, Agricultural Superintendent	From 6th May to 22nd November
Mr. O. W. Harrison, Technical Assistant ..	From 30th October to 24th December
Farm School—	
Mr. L. A. Powell, Assistant Master ..	From 30th June to 8th October
Produce Department—	
Mr. C. M. G. Purchas, Inspector of Produce ..	From 30th July to 26th November.

2. The expansion of activities remarked upon in the 1935 Report continued during 1936 and was accompanied by steady progress of work in all divisions. Members of the staff were called upon to take part in several important extra-departmental enquiries including the investigations of the Jamaica Banana Commission which sat in the Island from the beginning of January until May. Mr. H. H. Croucher, Agricultural Chemist, was appointed Secretary to the Commission, and Mr. F. E. V. Smith acted as liaison officer between the Commission and the Government. The Director of Agriculture and other officers were called upon from time to time to give evidence and to furnish detailed information.

3. Numerous other Committees and Boards continued to make heavy calls upon the time of the Director and of certain officers, so much so that comment has been made upon the amount of time occupied by such duties. It seems, therefore, desirable to mention that the close linkage of various Boards and Committees

concerned with different aspects of agriculture and matters related to the agricultural policy of the Island brought about by the appointment of the Director as Chairman, tends to a better co-ordination of agricultural policy and to assist in the development along right lines of such matters as land settlement, agricultural credit, and agricultural expansion and development.

4. The annual reports of the Central Lands Advisory Board, the Agricultural Development Board, and the Agricultural Loan Societies Board, which have already been separately submitted now accompany the annual report on the Agricultural Department. By bringing these and other subjects of deep agricultural concern to the Island more closely within the purview of the Department of Agriculture, it has been possible to bring into closer and more effective contact the investigation and research work of the Department with the practical problems of land settlement and agricultural development in the field.

5. The next step is the co-ordination of field services, in regard to which representations have already been made to the Jamaica Agricultural Society. The position whereby research and investigation, with some limited field instruction, are under the control of the Department of Agriculture while general field instructoral services are controlled by an independent body, tends to hamper the work of both and to check the rate of progress. Cordial relations between the Department and the Society have, I am glad to say, continued during the year, and although there would appear to be strong differences between the Board of Management and the Director of Agriculture in regard to field services, it is believed that these differences are more apparent than real, and that the Society is anxious to put itself in a position to play its part in field agricultural work more effectively than it can do under the existing arrangement.

6. The practice of publishing reports by divisional officers and of attaching summaries of those reports to the general report has been continued. A clear picture is thus obtained of the extensive and varied activities of the Department as a whole. I desire again to record my consciousness of the loyalty and devotion of the staff, which has been called upon to assume even greater responsibilities than were mentioned in previous reports. In the absence of a senior administrative officer in the Department it is inevitable that duties normally devolving upon an Assistant or Deputy Director should be undertaken by senior divisional officers, whose ready response to the additional burdens placed upon them is gratefully acknowledged.

7. The annual Staff Conference was held for the third time in January and was attended by the staff of the Department and by the Secretary and Supervisors of the Agricultural Society. The usefulness of these annual meetings has now been amply demonstrated and it is hoped that they will form a permanent feature of the activities of the Department.

8. The Summer Course of Lectures and Demonstrations was held during the period July 20th-25th, the meetings being well attended by members of the staffs of the Department and of the Society, as well as by the general public. A wide range of subjects was dealt with as is indicated by the following:—

Field Demonstrations—

Sugar cane varieties; progress in banana breeding; Farm and livestock inspection.

Lectures—

Soil erosion, its causes and prevention;
The practice of agriculture on small holdings;
Progress in citrus culture under the Government Development Scheme;
Fruit culture; The Reaping of fruit; Possibilities of expanding exports by means of secondary products;
Advantages of early maturity in livestock breeding;
Landscape Gardening.

For the first time gentlemen prominently connected with agricultural production and marketing were invited to take part in the proceedings. The following gentlemen responded to invitations to give lectures:

The Honourable F. M. Kerr-Jarrett—"The Sugar Industry of Jamaica, its present position and prospects."
Captain A. DePass—"The Marketing of Jamaica Coffee."
Mr. G. G. R. Sharp—"Observations on Marketing Jamaican Citrus."

9. The Government has approved that any officer or member of the Jamaica Agricultural Society attending the Summer Course should be granted a return ticket by the Jamaica Government Railway for the price of a single ordinary fare on production of a certificate signed by the Secretary of the Jamaica Agricultural Society. It is hoped that this concession may become more widely known in future years and that a larger number of country people will avail themselves of the opportunity of attending the Summer Course.

10. A noteworthy event of the year was the establishment of the Tobacco Development Scheme, which is being financed from the portion of the new loan allocated for purposes of agricultural development. The production of cigar leaf tobacco for export had been under careful consideration by the Department for some time prior to the actual introduction of the scheme. In 1934 the Director of Agriculture was Chairman of a Committee which reported in favour of the appointment of a Specialist to organise the production and marketing of cigar leaf tobacco. The subject came under the notice of the Agricultural Development Board appointed in November 1935, and early in 1936 Mr. F. W. Winckley arrived in the island to make a preliminary survey. He concluded that there were good prospects for the successful production of cigar leaf tobacco in Jamaica, and upon considering his report the Agricultural Development Board recommended the establishment of a three year development scheme. This was in due course approved and Mr. F. W. Winckley was selected by the Secretary of State for appointment as Tobacco Specialist. He assumed duty in July and successfully launched the scheme by establishing three demonstration and field trial centres. A number of growers became interested and provision was made to assist them by advances recoverable from the proceeds of the sale of their crops. Agreements under the Agricultural Loans Law, 1887 were entered into with 19 growers in respect of 119 acres, and by the end of the year the crops from the demonstration areas had been reaped. The growing conditions for tobacco were generally favourable, but unfortunately some growers planted late and although their crops promised to be good it was amply demonstrated that earlier planting was desirable.

11. The scheme included provision for the erection of a Tobacco Station at which the export crop could be graded, fermented and packed. A suitable site was secured on Government land and by the end

of the year the buildings were almost completed. A more detailed account of the progress under this scheme appears in another part of the Report.

12. The Citrus Development Scheme continued to progress and received considerable stimulus from the introduction of The Citrus Development Aid Law, 1935, and a Citrus Field Day held at Grove Place in December 1935. The result was a considerably increased demand for plants, which could not be met during 1936, as the nursery programme had provided for a reduced output in expectation of a falling-off in demand. The continued requests for budded grapefruit and orange plants from Government nurseries are an indication of a gratifying repsonse to the act of Government directed to the expansion of this important industry. Plans have been made for the issue of 40,000 budded plants during 1937. The report of the Citrus Development Aid Board, of which Mr. F. E. V. Smith is Chairman, will be found on page 79, Appendix No. 1.

13. A considerable expansion of the activities of the Low Temperature and Market Station was recorded during the year. The work carried on included low temperature investigations of banana varieties, citrus, mangoes, and numerous other fruits and vegetables, some of which have now been developed to a commercial stage, as will be seen by reference to the full report of the Station. A total of 16,472 packages of Miscellaneous fruits and vegetables, and 892 bunches of bananas were shipped from the station during the year.

14. In order further to develop the production of mangoes of the so-called "Bombay" (Pairi) variety for local consumption and export, a mango budding campaign was instituted by the Department in the districts of Lower St. Andrew in August. The total number of trees cut back for budding was 2,100 and by the end of December some 600 young trees had been budded. This work was carried out under the supervision of Mr. J. B. Sutherland, the Supervising Inspector of Plant Diseases.

15. Jamaica participated for the first time at the British Industries Fair in January 1936, and a comprehensive display of island produce was shown, a particular feature being made of fruits and vegetables. General arrangements were carried through by the Permanent Exhibitions Committee, of which the Director of Agriculture is Chairman. The London organisation was placed in the capable hands of the West India Committee, with whom were associated Messrs. T. J. Poupart Limited of Covent Garden, whose unstinted service is warmly acknowledged. This occasion offered a convenient opportunity for the publication of a booklet to illustrate Jamaican mangoes and other fruits and vegetables, which was designed and executed by Messrs. Waddie and Company of Edinburgh. Though it is early to assess the results, there were indications during the year of greatly increased interest in Jamaica's minor agricultural products and it is hoped and expected that participation in future Fairs will continue to keep before the British public the numerous fresh products obtainable from Jamaica during winter and early spring.

16. Exhibits of Jamaican fruits and vegetables were staged at the Imperial Fruit Show at Liverpool where the stand, which was arranged and supervised by Messrs. T. J. Poupart Limited, attracted considerable attention. Useful publicity in the commercial Press was obtained.

*

B. Production.

17. The mean total rainfall for the Island during 1936 was 86.20 inches which is 12.33 inches in excess of the average. During the first six months of the year the rainfall was 57% above the average but in the second half it was 12% below. No serious storms or hurricanes occurred during the year, but northers were experienced on the northside in the latter part of December and occasioned slight damage to banana cultivations. Two strong wind storms, one in July and one in October swept through an arrow path passing through southern Saint Andrew, lower St. Catherine and parts of Vere, which damaged banana cultivations and caused an estimated loss of about 150,000.

18. Despite the effect of the two storms of 1935 upon the year's production of bananas, the value of agricultural products again showed a marked increase over the previous year, which should be regarded generally, as a good one from the point of view of production.

19. Apart from favourable weather conditions there was a substantial improvement in market for certain commodities—cocoa, pimento and honey particularly. The value of the Colony's four principal exports which ranked next in order to bananas, namely—sugar, rum, citrus and coffee, increased from £967,700 in 1935 to £1,178,000 in 1936. These four items together represented in value a little less than one-third of the total value of the produce of the Island, as disclosed by Customs returns which show that the grand total of exports in 1936 was £3,697,608 as compared with £3,691,494. Again, excluding bananas there was an increase in the value of all other Jamaican products amounting to £268,915 over the previous year. It may be of interest to give a five-year comparison of the total value of products exported, including bananas, and the value of products exported, other than bananas:

	Total Value including Bananas.	Value excluding Bananas.
1932* ..	£3,271,357	£1,402,246
1933* ..	2,771,498	1,753,022
1934 ..	3,219,072	1,200,596
1935* ..	3,691,494	1,517,088
1936 ..	3,697,608	1,786,003

* Years in which serious storms occurred.

It is thus clearly shown that there is a marked tendency for the value of products other than bananas to increase, which may be taken as an indication of the Colony's general agricultural improvement. The exports of bananas in 1936 were 18,762,794 stems (11,742,279 counts) valued at £1,911,605, compared with 20,379,326 stems (13,098,330 counts) valued at £2,174,406 in 1935. It is again observed that these and other export statistics are furnished by the Collector General, whose returns are compiled from Customs export statements. Examination of the prices paid to growers for bananas throughout the year, and of the internal charges involved by commissions, transport costs and wharfage indicates that the actual value of

* This portion of the Report closely follows Chapter VI. "Production" in the Annual General Report.

the banana industry to the Island in 1936, i.e., the amount of money circulated in the Colony, was approxemately two and a quarter million pounds. The storms of 1935, as well as affecting production during that year, reduced the output during the early months of 1936, and it was not until the middle of May that weekly exports approximated to the normal figure. From then until the end of the year the exports were mainly typical of those of a normal year, except that in December the quantities were rather greater than usual. The peak export occurred during the period July 4th to August 15th, and on five occasions within that time weekly quantities shipped exceeded half-a-million stems.

20. The effect of Panama Disease upon banana cultivations continues to be felt and is now proving a serious limit to production, particularly in parts of St. Mary and Vere. Conditions in the latter district of the parish of Clarendon are not the best for banana production, and the experience of large planters there indicates that banana production may be considerably reduced, giving place to sugar cane and other crops. Inspectors of Plant Diseases in all districts of the Island have been required to exercise increased vigilance and to enforce the Law and Orders relating to the control of Panama Disease. The modified treatment authorised in 1935 is being applied with discretion, but steady pressure upon cultivators of all classes continues to be necessary to ensure the prompt treatment of cases. The field work carried out by the Agricultural Chemist has disclosed useful information in regard to the spread of Panama Disease over a period of three years. Of 67 cases recorded between May and November 1936, 56 occurred in trees infected from a former case. In the field under observation only 11 new centres of infection were observed, and of those several are separated only by one tree from an infected area. It may therefore be regarded as unfortunate, from the theoretical point of view, that any change was made by the so-called "nine root" system of treatment to the "one root" in certain highly infected areas. The practical difficulties and heavy expense of continuing the former method, combined with active and passive resistance on the part of planters, and the general unpopularity of plant disease control work as then carried on in relation to Panama Disease, rendered it essential to make a change. Had this not been done the number of untreated cases, and concealed cases which were steadily increasing would have rendered abortive the work being done by the plant disease inspection division.

The work of the field officers concerned is still unpopular and they frequently are brought in conflict with the planting community in their efforts to secure prompt treatment of infected plants and the quarantining of affected areas. Every endeavour is made to secure the understanding and support of influential members of the community who will, it is hoped, continue to stand by the Department and its officers in their efforts to check the rate of spread of this menace to the banana industry.

21. Steady progress with the banana breeding work carried on by the Botanist was maintained during the year and several new seedlings came under test. The value of having an area of land near to the Laboratory in which seedlings can undergo preliminary field trial, was amply demonstrated during the year. Close touch was maintained with the Imperial College of Tropical Agriculture, Trinidad, in regard to this, as well as other subjects, and although not strictly falling within the review of the year's work, it is desirable to mention that a conference took place between Professor E. E. Cheesman and Mr. L. N. H. Larter early in January 1937, which resulted in the preparation of a joint memorandum on the present position of banana breeding work and a recommendation for a further search for wild parents. Although the seedling S.19, hitherto the most promising of those evolved, has proved to be commercially unsuitable under ordinary conditions of transport and ripening, it is desirable further to investigate this seedling under different growth conditions. Steps are therefore being taken to establish plots in order to test the seedling under different types of soil and climate and to examine the fruit under low temperature conditions with a view to ascertaining whether any differences in character occur as a result of particular environmental conditions, and whether altered conditions of storage and ripening will prove more suitable to this variety. It is hoped that these enquiries will give results of value, not only in connection with S.19, but with other promising seedlings now under observation.

22. The Leaf Spot of bananas caused by the fungus *Cercospora musæ* made its appearance in several districts of the Island, but was most apparent in areas which had been affected by unusual weather conditions in the months of May and June. This condition has become apparent in the Caribbean area during the past few years and has given considerable trouble in Honduras where special measures have been taken to cope with it. Early action was taken in Jamaica to observe the onset of the disease and to test possible methods of control. Two officers of the Department of Agriculture visited Honduras to study the situation there, and upon their return definite experiments were planned in order to observe the variation in intensity of infection and possibilities of methods of control. Equipment and materials were imported by the Government in readiness to commence a control campaign by means of spraying, should that prove to be necessary, but at the time of writing there is no indication that the disease is likely to prove a serious factor in banana production in Jamaica. The position is, however, being most carefully watched and it is hoped that further experience will confirm the present opinion.

23. Reference was made in the report for the year 1935 to the generous contributions of the three fruit exporting companies of a total annual sum of £800 for a period of three years, to enable special manurial experiments on bananas to be undertaken by the Department. Four experiments have been commenced and it is hoped to lay down two more. Hitherto such field experiments have been carried out in co-operation with planters, who, while willing to assist the Department, have been anxious to secure the fruit as soon as it is ready to reap, with the result that detailed observations at the time of reaping have been impossible to make. The general advantages of having the complete experiments under full departmental control, and the work carried out so far, are dealt with in detail in the report of the Agricultural Chemist.

24. In the Report for 1935 reference was made to the anxiety which was felt in regard to the Jamaica Banana Producers' Association and to the appointment of a Commission to investigate the banana industry. That Commission consisting of Mr. W. Gavin, C.B.E., Mr. Furnival Jones and Mr. J. H. Gorvin, C.B.E., sat in Jamaica from January until May, during which time the banana industry at all stages, from production to marketing, was thoroughly investigated. At an early stage in their proceedings the Commission was able to bring about a tentative working arrangement between the United Fruit Company and the Jamaica Banana Producers' Association, to which the Standard Fruit and Steamship Company were also a party. This arrangement worked satisfactorily and resulted in uniform prices being paid by all three exporting

companies for fruit at the time of delivery, thus removing the difficulties experienced by the Association in their previous system of working which involved the payment of an advance upon the fruit at the time of delivery, with a subsequent payment when market returns had been ascertained. The Legislative Council approved of the Association being guaranteed in a sum of £10,000 for a period of six months to enable outright prices to be paid, and it is satisfactory to note that over the period of the whole year the Association made a small profit and did not find it necessary to call upon the Government to implement the guarantee.

25. The recommendations of the Jamaica Bananas Commission, contained in their extensive and valuable report which was issued to the public in August 1936, have now received the approval of the Legislative Council which enacted three Laws:

(a) Law 20 of 1936—A Law to reconstitute the Jamaica Banana Producers Association Limited into a Trading Company.

(b) Law 21 of 1936—A Law to provide for the issue by the Jamaica Banana Producers Association Limited of Debentures and for Government Guarantee of such Debentures.

(c) Law 24 of 1936—A Law to enable the Regulation and better control of the Banana Industry.

The terms of the Agreement amongst the Companies were the subject of considerable discussion which took the form of friendly negotiations. These have now been concluded and the Agreement ratified. It is confidently expected that this Agreement, combined with the legislation referred to above, will ensure the prosperity of the banana industry for ten years.

26. *Sugar.*—The total production of sugar by the 34 factories operating in the Island was 91,463 tons compared with 76,753 tons in 1935. There was also a substantial increase in exports of sugar, both in quantity and value, the amount exported in 1936 being 77,809 tons valued at £632,451 compared with 68,739 tons valued at £558,464 in 1935. There was a marked expansion in the production of cane supplied to factories by cane farmers. The comparative figures for the past three years, furnished by The Sugar Manufacturers' Association of Jamaica Limited are:

Year.	No. of Cane suppliers.	Tons of Cane supplied.
1934 ..	2,144	106,541
1935 ..	3,838	160,848
1936 ..	4,966	175,598

Attention is being given to the encouragement of improved methods of cultivation with the object of increasing yields of cane for smaller and less experienced growers.

27. The periodical issue of field and factory statistical records compiled by the Department of Agriculture with assistance given by the Sugar Manufacturers' Association was continued. "A Survey of the yields of Sugar Cane in Jamaica for 1934-35" was published by the Department of Agriculture as Bulletin No. 8 during the year. The returns received for the compilation of this report represented 93% of the total cane grown at the 34 factories compared with 78% for the previous annual period.

28. It might be of interest to record information furnished by the Sugar Manufacturers' Association of Jamaica Limited, in regard to the number of workers employed in factories, on sugar estates, and in producing farmers' cane for supply to factories. The figures published have been obtained from returns sent in by the 34 factories and estates operating in the Island:

	In Crop.	Out of Crop.
Labourers—Men	27,695	17,023
" Women	11,025	7,504
Skilled Workers	2,181	1,288
	40,901	25,815

It will be observed that the figures are in respect of actual workers. The number of people whose livelihood is dependent upon the sugar industry includes the dependents of the workers, in respect of which no accurate information for recent years is available. I consider that a factor of three could be applied, which would make the total number of people supported by the sugar industry in crop 120,000, and out of crop 75,000 (in round figures).

29. The Advisory Committee on the Sugar Industry, to which reference has been made in previous reports, continued to render valuable assistance to the Department. One recommendation which was put into effect was that a meeting of the technical staffs attached to the various estates and factories should be held with the object of discussing the various problems relating to the sugar industry in Jamaica. A conference was therefore called for the 27th November when a widely representative gathering met at Hope under the Chairmanship of the Director of Agriculture. Keen interest was taken in the proceedings and a resolution was adopted to the effect that "an Association of Sugar Technologists in Jamaica should be formed." A Managing Committee and a Technical Committee were appointed by the meeting. Draft rules have since been prepared and a gratifying response of persons applying for membership secured. The formation of this Association should assist materially in consolidating the work which has been done for the benefit of the sugar industry in Jamaica during recent years and promote the discussion of technical problems as well as improve field and factory practice.

30. *Rum.*—A still further increase in the exports of Rum occurred in 1936, the figures being 671,335 gallons valued at £194,645 compared with 466,259 gallons valued at £149,998 in 1935. It is reported that a greater demand for rum is now being experienced.

31. *Citrus.*—The citrus industry experienced a very good year, which gave promising indications for future production both for local consumption and export. The New Zealand market for oranges which has been developed since the 1933-34 season when exports to that Dominion first commenced again provided an outlet for 58,217 boxes of oranges during the calendar year. Total exports of oranges in 1936

were 346,728 boxes valued at £120,233. This quantity included 89,246 boxes of bitter oranges exported for marmalade manufacture, which were valued at £23,856. Orange exports for 1935 totalled 143,597 boxes valued at £56,625. The exports of this fruit in 1936 were 4½ times the quantity and nearly 4 times the value of those for the year 1934. Grapefruit exports totalled 180,678 boxes valued at £69,765 compared with 107,166 boxes valued at £47,170 in the previous year. There is a substantial local market for oranges and grapefruit the consumption of which cannot be ascertained.

32. Work was continued from fertilizer and growth observations with citrus at Grove Place and 20 acres of land were acquired on a ten years' lease near Bog Walk for the purpose of establishing similar field trials there. The land selected is typical of considerable areas in which citrus can be grown and similar to that in which this crop has already been successfully established. These field experiments are under the general control of the Agricultural Chemist, who is assisted by the Agricultural Superintendents.

33. The future of the Citrus Industry is promising despite the set-backs experienced by some individuals owing to market fluctuations and to the fact that seeded grapefruit can only command a remunerative price in export markets for short periods of the year. From the export point of view the Citrus Industry ranked fourth with a total f.o.b. value of £190,000 in 1936 excluding minor products such as limes, orange oil, lime oil and lime juice. Increasing quantities of the "seedless" types of grapefruit are now being produced as a result of the Government Citrus Development work, while marked improvements have taken place in the processing and packing of fruit for export. There are now 7 mechanically equipped packing houses in the Island compared with 2 in 1935.

34. The Jamaica Citrus Producers' Association was unable to surmount its difficulties though it continued in operation. It became necessary for the Government to take over the Packing House, formerly leased at a nominal rental to the Association. Legislative Council approved of the payment of a sum of £2,600 to the Association in respect of additions to the Packing House and equipment which had been made at the Association's expense, and to defray a part of the expenditure which had been incurred by the Association for the benefit of the industry as a whole. The Packing House was operated by the Department of Science and Agriculture with effect from the 1st June.

35. *Pimento.*—Pimento production continued to be affected by the Rust Disease which has caused a practical cessation of output in the higher altitude districts, particularly in south Manchester. A careful study of the disease has indicated that it can only seriously affect trees where conditions of temperature and humidity are favourable to its development, and that as a general rule it will be confined to higher altitude districts, particularly those above 1,000 feet. Apart from localized outbreaks under exceptional weather conditions it is unlikely to affect pimento growing in the lower districts. No method of control which is sufficiently cheap to permit of economical application is available. Exports of pimento for 1936 were 5,888,425 lbs. valued at £140,858 compared with 8,047,863 lbs. valued at £80,725 in 1935. Exports for 1936 were less than half of those for 1934, but the value was almost 50% higher.

36. The production of Pimento Leaf Oil by distillation which almost ceased for a time was recommenced towards the end of the year, when three stills were in operation in south Manchester. The price paid for leaves was 1/3 per 100 lbs. delivered to the still, which gives a return for each tree consideably in excess of the annual value of the crop of berries.

37. *Honey.*—There was a decrease in the quantity of exports but an increase in value compared with 1935, the figures being 1,630,671 lbs. valued at £15,155 in 1936 compared with 1,872,400 lbs., valued at £13,585 in 1935. The outbreak of Foul Brood Disease of Bees mentioned in the previous report was brought completely under control during the year.

38. *Coconuts.*—The production of coconuts was to some extent affected by the storms of 1935. Markets for whole nuts were poor during the earlier months of 1936, but prices and demand improved markedly in the latter half of the year. The general position of the industry showed improvement, and local prices for copra supplied to oil and soap factories rose in sympathy with the advance in overseas market values. Competition for the local edible oil market amongst the factories led to a renewal of the pool agreement for a period ending on 31st March, 1937, which time was later extended to the 30th April.

39. The Jamaica Cocoanut Producers' Association Limited experienced a satisfactory year. The acquisition of a soap factory, which was transferred to new buildings on the same site as their oil factory, has ensured a permanent outlet for crude coconut oil surplus to the Association's market for edible oil.

40. Exports of whole nuts totalled 31,406,479 valued at £76,276, compared with 37,256,680 valued at £91,187 in 1935. Exports of Copra were negligible. In the absence of a system for the collection and recording of agricultural and industrial statistics, it is not possible to give more than a general indication of the industry as a whole. The internal demand for edible oil is now almost entirely met by the locally produced coconut oil, and the manufacture of laundry soap containing coconut oil supplies nearly one-half of the Island consumption. Apart from these large-scale industrial uses of coconuts and coconut products there is a considerable production of oil by families, who extract coconut oil by a simple process in their houses, and a high consumption of "water coconuts", for drinking purposes, particularly in the larger centres of population.

41. Control work on the Bud Rot of Coconuts was continued in St. James and Hanover. Plantations in other parts of the Colony are in a healthy and productive condition.

42. *Ginger.*—Exports again showed an increase from 2,879,017 lbs. valued at £69,938 in 1935 to 3,420,772 lbs. valued at £72,636 in 1936.

43 *Cocoa.*—The continued low prices which remained current until May led to neglect, and in some cases, destruction of trees, but the marked increase in price in export markets which occured during the latter months of the year stimulated interest in the crop. Exports fell to 3,640,405 lbs. which was 72% of the quantity exported in 1935. The value, however, was practically the same, being £49,684 compared with £50,111 in 1935.

44. *Coffee.*—This showed a substantial increase in quantity from 7,593,697 lbs. in 1935 to 10,396,688 lbs in 1936 valued at £160,980, some £5,500 higher than the value of exports for the previous year. Considerable interest was displayed in the marketing of coffee during the early part of the year and enquiries made in regard to both Blue Mountain grades and lowland coffees led to a better understanding of the position and will, it is hoped, result in improvements in conditions under which the latter is produced.

45. *Miscellaneous.*—Exports of Logwood and Logwood Extracts were somewhat lower than in 1935. The value of exports of other products increased from £106,347 in 1935 to £132,075 in 1936. This is partly accounted for by exports of minor fruits and vegetables such as mangoes, limes, capsicums, potatoes, egg-plants, and other vegetables, the production of which is being encouraged. The Department of Agriculture, through the activities of the Low Temperature Station, exported 16,281 packages of miscellaneous fruits and vegetables, principally to the United Kingdom and Canada. Special efforts were made to improve the marketing of limes, of which considerable quantities were shipped to England for the first time. 13,681 packages of limes valued at £7,358 were exported during 1936, compared with 3,317 packages valued at £2,284 in 1935.

The exports of Lime Juice decreased, while those of Grapefruit increased considerably, the total quantity of the two kinds together amounting to 48,645 gallons in 1936 compared with 47,119 gallons in 1935.

46. Exports of Kola Nuts doubled in quantity and almost trebled in price, amounting to 482,157 lbs. valued at £2,732 in 1936.

47. Annatto decreased in quantity by 5½% but increased in value by 3% compared with 1935. The exports in 1936 were 862,973 lbs valued at £9,535

48. Essential Oils increased in quantity and value by approximately 50%.

49. The production of potatoes for export has been the subject of enquiry for some time. In 1935 a Canadian Company conducted large scale field trials in Manchester with a view to determining the possibility of establishing commercial scale production in Jamaica. In 1936 this company (The Jamaica Development Company) acquired land in St. Ann on which planting operations were commenced later in the year. Some 200 acres were put under crop and exports commenced early in 1937.

50. *Cattle and Beef Industries.*—The total number of cattle slaughtered for human consumption as disclosed by official returns, was 34,584 head; an increase of 1 over the previous year. The parishes of Kingston and St. Andrew accounted for 11,689 head in 1936, or 81 less than in 1935. There has been a slight improvement in the market price for beef cattle. Plans have been received for the proposed new slaughter house to be erected in Kingston on which it is hoped that work will be commenced shortly. Provision is to be included for the preparation of by-products and investigations have been instituted on the possibility of establishing a beef cannery.

51. *Hides and Skins.*—There was a considerable increase in exports of Hides and Skins both in quantity and value. Hides of cattle exported in 1936 amounted to 21,547 valued at £11,322, compared with 20,405 valued at £9,458 in the previous year, while Goatskins increased by 22% to 231,551 valued at £20,811 in 1936, compared with a value of £14,398 in 1935.

52. Considerable interest continues to be displayed in the Dairy Industry and an enquiry into the prospects of establishing butter production on a larger scale has resulted in a scheme for the erection of a Central Butter Factory, to which consideration is now being given.

53. *Agricultural Development Board.*—The Agricultural Development Board, set up in 1935, recommended the introduction of a Tobacco Development Scheme, which received the approval of the Legislative Council and the Secretary of State, and was put into effect during the year.

54. *Agricultural Education.*—The Government Farm School had an average attendance of 50 students, an increase of 4 over the previous year. 14 students completed the three-year Course and received diplomas at the Annual Graduation in July. The employment of students after they have undergone training at the Farm School has shown considerable improvement. There are now 24 ex-students employed by the Department of Agriculture and 7 by the Jamaica Agricultural Society, while the demand for these young men by other organisations and by the general planting community is a pleasing indication of the esteem in which the School is held. It is satisfactory to record the increased interest taken in the institution by members of the public who attend the various annual functions held at the School.

55. The first Practical Training Centre for boys at Holmwood is now well established and some 40 boys are receiving instruction in agriculture and in various useful trades. The general scheme of instruction has been given an agricultural bias and the 40 boys who attend the school appear to take a very keen interest in their work. The centre was opened early in the year and excellent progress has been made with the cultivation of the land. Coffee, citrus, bananas, potatoes and other crops are being grown, while attention is also paid to livestock. A valuable feature of the school is the care which is being devoted to land utilisation and crop husbandry with a view to avoiding such undesirable practices as the burning of bush when land is being cleared, and the waste of organic matter which can be used as mulch.

56. The increased public interest being taken in the Hope Stock Farm and the Stud Farm and Experiment Station, Grove Place, is evidenced by the numerous parties from country districts who visited these farms during the year. Branches of the Jamaica Agricultural Society formed the majority of such visitors and organised parties of school children applied for and were granted permission to visit the farms during school holidays.

57. Articles on subjects of agricultural importance were contributed regularly by members of the staff of the Department of Agriculture for publication in the Journal of the Agricultural Society. Three departmental bulletins on Dairying, Insecticides, and The Yields of Sugar Cane in 1934-35, were published during the year.

A. C. Barnes,
Director of Agriculture.

C. Summaries of Divisional Reports.

Summary of the Report of the Superintendent of Public Gardens and the Horticulturist.

Weather conditions were very favourable and there was no damage by flood rains.

The orchid collection was again increased this year by the additon of a number of Calanthes and other orchids. The orchid seedlings have made good progress this year and there are signs of some of the crosses flowering for the first time during 1937.

Dwarf and semi-dwarf varieties of dahlias were introduced for trial in the lowlands. The dwarf varieties are not considered suitable for the lowlands.

Two Talipot Palms (*Corypha umbraculifera*) flowered in Hope Gardens.

New features in the Gardens were the erection of a Band Stand in which concerts are to be held on the first and third Sunday afternoons in each month, and the addition of an Aviary bequeathed by the Hon. A. E. DaCosta, O.B.E., to the Government for Hope Gardens.

The rainfall at Castleton Gardens was above the average. Slight damage was done to the pathways during the heavy rains in May.

The Public Gardens were satisfactorily maintained.

At King's House Gardens a view to the sunken garden was opened up by a semi-circular excavation extending from the sun-dial to the sunken garden. The re-surfacing of two tennis courts was carried out.

M. S. Goodman,
Superintendent Public Gardens.

E. J. Downes,
Horticulturist.

Summary of Report of Superintendent Experiment Station, Hope.

The rainfall for the year was above the average but this was so well distributed throughout the year that there were no flood rains which did damage to the fields and roads.

Free distribution of a large number of cuttings of cane varieties was made to Estates and cane farmers. A large number of cuttings of May 28 and F.C.916 was distributed this year. The total distribution of cuttings was slightly lower than last year as the demand was only for the newer varieties of cane. Seven Barbados bred varieties of cane were introduced through the Central Plant Quarantine Station, Trinidad. These are very susceptible to Mosaic Disease.

The experiment carried out with regard to ratooning of Pigeon or Congo Peas will again be repeated. A large quantity of Bombay Mango budwood was distributed for converting common mango trees into Bombay.

The general routine work was attended to and a tidy appearance was maintained.

M. S. Goodman,
Superintendent.

Summary of Report of the Superintendent of Sugar-Cane Experiments.

The visit to Puerto Rico by two members of the Sugar Manufacturers' Association and myself was very instructive and we benefitted greatly from it. Two meetings were called at the office of the Imperial Association and the visit to Puerto Rico discussed with the planters.

The rainfall was well distributed throughout the year in all the cane areas with the exception of Trelawny where it was exceptionally dry until July. Owing to the severe and prolonged drought in this district it is expected that the crop of 1937 will not be as large as the past one, but it is estimated that the crop for the whole Island will exceed that of 1936.

Manurial and cane variety experiments were conducted this year and the results will be dealt with by the Agricultural Chemist. Additional cane variety experiments were laid down at Golden Grove and Moneymusk.

The small cane farmers are rapidly increasing in number owing to the ravages of Panama Disease and most of the factories have reached their maximum production, which has restricted the production of the small farmer.

M. S. Goodman,
Superintendent.

Summary of Report of Headmaster Farm School.

The Government Farm School completed the year with an average attendance of 49 students, the highest number since 1931, and an increase of five over the year previous. At the Annual Graduation held at the school on July 9th, 14 Third Year Students received Diplomas in Practical Agriculture. During the year the employment situation improved with the result that the majority of students who have recently left the School have been able to find work.

The usual curriculum was carried out, with the exception that Entomology was added to the subjects given to the Second Year Students.

The Third Year Students spent the half of each term at Grove Place. The Third Year Students made several trips into the country to visit estates and factories.

The Farm School Experiment Station is now well established with all the crops grown in this area. Difficulty is encountered with lack of water for the crops in the Station.

The number of visitors to the School increased during the year, and several large parties visited the institution.

The health of the students during the year was good and no serious outbreak of illness was reported.

During the year the Senior Assistant Master was away from the Island from June 30th to October 9th.

J. W. Howe,
Headmaster.

Summary of Report of Farm Superintendent, Stock Farm.

The year was only an average one for livestock on the Liguanea Plain. The rains terminated at the end of October and drought was felt earlier than in former years. The number of livestock showed an increase of 27 head over the previous year, while the value showing a decrease of £431 15s. 0d. The number of calvings was practically the same, only one increase over the previous year. The health of the stock for the year was good. No reactors to the tuberculosis tests of April and November were found.

Only one purchase of livestock was made during the year, that being a Red Polled bull purchased from Capt. Harvey of Darliston. Sales of livestock compared favourably with the previous year.

Milk production showed a decrease of 2,530.50 quarts over 1935, while milk sales showed an increase of 11,004.50 quarts.

During the year there were 43 cows sent to the bulls standing for public service at the Farm. During the year a Guernsey bull was stationed at Llandewey in the parish of St. Thomas, for public service.

The mango crop was the largest for several years and shipments to England brought satisfactory returns. The re-afforestation programme on the Liguanea Ridge was continued.

Buildings and improvements included a new clipping shed, hay shed, and litter carrier. The old clipping shed was converted into a garage.

The number of visitors to the Farm was larger than the previous year. A football competition for the employees of the Farm was organized, and prove most successful. A cup was donated for annual competition by a hardware firm in Kingston, and was presented to the winners.

J. W. Howe,
Farm Superintendent.

Summary of Report of Government Stud Farm and Experimental Station, Grove Place.

1. *Weather*—A record rainfall of 134.72 inches was recorded, with heavy weather in the summer months.

2. *Experimental Station.*—Trials with Alfalfa and Clover have met with such success that extension of these crops under pasture conditions are being made.

Experiments in manuring of potatoes, growing toabacco and Guatamala grass have been undertaken and the work in leguminous crops for covers and green manure continued.

Two large-scale experiments, one in citrus and the other in banana have been started.

Two manurial experiments in potatoes were completed, and a study of citrus roots for Fiddler Bettle damage undertaken.

The nursery, vegetable, root and catch crop sections of the Station were fully maintained.

3. *Live Stock.*—All classes of Live Stock kept good health, a previously-reported series of death among heifers from impaction having been brought under control.

An out-standing two-year old filly was reared.

The Berkshire breed of pigs have proved suited for crossing with native sows and this and other stud services have been in high demand by the public.

4. *Agricultural Education.*—Farm School senior students continue to take part of their course at the Farm. There have been numerous visits of planters in small and large parties and many demonstration days were organised and carried through.

5. *General.*—An imposing new range of stables was erected and sold stalls re-roofed.

Arthur Thelwell,
Agricultural Superintendent.

Summary of Senior Veterinary Officer's Report, 1936.

1. Island weather conditions in relation to livestock.

2. The cattle industry (its continued depression) and a comparison between Imports of Animal Products and Exports and Local Production of meat, milk, butter, hides and skins.

3. Field work with observations:—

(i) Diseases notifiable under the Law: Foot and Mouth, Anthrax, Swine Fever.

(ii) Other infectious diseases: Tuberculosis, Infectious Bovine Abortion, Tick Fevers, Blackleg, Canine Distemper, references to Parasitic Diseases of Livestock.

4. Report on Hope Farm and Grove Place.

5. Veterinary services to Public Works Department, Prisons Department, Lunatic Asylum.

6. Educational work in Farm School, Summer Lectures in Agriculture and Short Course in Beekeeping (Staff Conference Week).

7. Statistics.

8. Report of 1936 on American Foul Brood of Bees.

S. Lockett,
Senior Veterinary Officer.

Summary Report of the Agricultural Officer.

1. Field work in citrus extension has been moving as before in St. Mary, but is now growing rapidly in Clarendon, St. Catherine, Manchester and St. Ann. The heavy soils make good promise after nearly three years of growth in spite of the indifferent attitude of the large landowners.

2. The parish of Clarendon has handled more plants this year than any other, though the rate of growth of plants has been delayed due to neglect in circle weeding around the plants and to slugs. In St. Ann the two cases of planting by the Department are a credit to the plants, there being no losses in 350 at one property, and only two at another.

Plant growth in the Blue Mountains elevations is a trifle slower but where cared there is nothing to be despised. Green manuring is essential and successful where tried.

3. Spraying is gradually being executed by the owners of 100 plants and over, while the smaller lots still remain a charge upon the officers of the Department and the Jamaica Agricultural Society.

4. Interplanting of small crops is encouraging where it has been practised. The windbreak effect is highly beneficial and the resultant tillage has advanced the citrus plants, the only care necessary being to preserve the requirements of the major crop. Sweet potato cultivation is not usually recommended and is permitted where it seems impossible to get the forking done otherwise. Irish potatoes have proved successful in maintaining fertility and yielding profits, and if followed by a Red Pea (Red Kidney Bean) crop are of still further use. With other vegetables they have been shipped by our Low Temperature Station. The interplanting of citrus lands, with the co-operation of the small cultivator on a six or 12 months' tenancy, has been successfully practised by larger land-owners.

5. Demonstration Plots are carried on but all the best planters keep their places wholly under the direction of the Department.

6. Loans for Citrus Development have resulted in 211 acres being planted by 25 persons, all interested in their project.

7. The Nursery plants have not been available and orders have in consequence had to be curtailed. Nearly all of the 17,632 plants distributed during the year were set by our staff or the Jamaica Agricultural Society's Officers.

8. The Staff Conference and the Agricultural Show at Highgate were attended by me, while among other extraneous duties I took the Tobacco Specialist to the tobacco fields and curing houses in St. Andrew. Assistance was rendered also in the Head Office in the absence of the Chief Clerk, and in inspections of properties under the Land Settlement Scheme.

L. L. CARRINGTON,
Agricultural Officer.

Summary of the Report of the Deputy Island Chemist.

Total No. of Samples analysed for—			
The Police Department			2,865
Customs and Excise Department			457
Department of Science and Agriculture			12
Island Medical Department			24
Department of Public Works			62
Jamaica Government Railway			2
Education Department			1
Kingston and St. Andrew Corporation			4
Total Official Samples			3,427
Government Stock Farm (Milks)			1,012
General Samples, Cattle Dips			52
Sugars			22
Rums			98
Waters, potable			13
Miscellaneous			74
Total General Samples			1,271
Grand Total of Samples Analysed			4,698
No. of Exhibits analysed:—			
Human Viscera and Organs for Poison			187
Animal viscera (cow) 1, (dog) 1			2
Under the Coinage Law:—			
Counterfeit coins and Coining Exhibits, including genuine coins			1,211
Under the Dangerous Drugs Law:—			
Opium Exhibits, 155. Ganga Exhibits, 501			656
Under the Spirit License Law:—			
Rums, Whisky, Gin, Brandy, Liqueurs, etc.,			85
Under the Medical Laws:—			
Medicines, etc.,			18
Under the Petroleum Laws:—			
Kerosines			4
Under the Drugs and Poisons Law:—			
Drugs, Chemicals, Medicines, etc.			13
Under the Gunpowder and Firearms Law:—			
Gunpowder and Revolver Cartridges			201
In connection with Murder Cases			46
Criminal Abortion cases			12
Cases of Obeah			42
Arson Cases			154
Substance suspected to contain poison			216
Miscellaneous cases			18
Amount collected for Laboratory Fees		£184 5 6	
Amount collected for Laboratory Sales		£995 0 0	
Laboratory Staff:— Deputy Island Chemist	1		
Assistant to D. I. C.	1		
Technical Assistants	4		
Clerk and Storekeeper	1		
Apprentices	1		
Total	8		

The work done in the Chemical Laboratory was derived as shown in the following Table:—

Police Department	2,865 samples	61 per cent.
Customs Department	457 "	10 " "
Other Government Offices	105 "	2 " "
Government Stock Farm	1,012 "	22 " "
General	259 "	5 " "
Total	4,698	100

Fees amounting to £184 5s. 6d. were paid in respect of 207 General samples submitted by the Public and as these only represent 4.4% of the work, on a sample basis, done by the Laboratory, it is evident the 95.6% of the work was done free of cost for Government Departments.

454 Certificates were issued to the Police during the year. 187 specimens of human viscera and 14 specimens of vomit were analysed in connection with 113 deaths. Poison was found in 41 cases of death, and in 10 specimens of vomit.

A few cases of interest were as follows:—

2.34 grains of Opium alkalodis were separated from the viscera of a male adult who committed suicide Traces of Opium were found in a tumbler, and tincture of Opium in a bottle.

A case of attempted poisoning by Dumb Cane juice which was added to milk showed that whereas the Dumb Cane retained its noxious properties for some time if the milk was kept cold, yet boiling the milk appeared to destroy the noxious nature of the mixture. Dumb Cane was found by microscopical examination of the cold milk, but failed to reveal it after the milk had been boiled.

A case of suicide by taking cyanide of potassium showed that 25 grains of the cyanide were left in the stomach of the deceased.

Cases of poisoning by bitter cassava were absent so far as human beings were concerned during the year, but a case was investigated where it was used in food to destroy pigs. A case of poisoning by Strychnine which caused the death of two persons was investigated. This poison was administered in stout to four persons, two of whom died and the other two who took less of the stout recovered. Strychnine was found in the viscera of the two deceased, in the vomitus of the two survivors, and also in the remains of stout in the bottle. An unusual case of suicide was found to be caused through a woman drinking nitric acid, of which large traces were found in the stomach.

The case of sudden death of a child showed that the stomach contained several Genip seeds, and the Post Mortem examination revealed that a seed had stuck in the gullet causing death by asphyxiation.

An unusual case of poisoning, which is still *sub judice*, revealed the presence of a quantity of resinous substance in the viscera of a man who dies suddenly. Search in the house of a suspect revealed the presence of a quantity of mamee sapota bark, resinous matter and decoctions of resinous matter. Investigations are now proceeding to ascertain the nature of the constituents in Mamee bark and the gum derived from the bark.

During the year a micro-photographic apparatus was obtained which will facilitate the production of microphotographs for production in Court. Recommendations have been made for the improvement of the dark room to facilitate the use of photographic methods.

Attention has been given to the extended use of microchemical tests for the detection and determination of minute quantities of various substances, with a view to expediting the analysis of viscera and foods for poisons.

W. L. Barnett,
Deputy Island Chemist.

Summary of Report of Government Entomologist for 1936.

General Remarks.—During the year the writer was on vacation leave from the 12th of March to the 27th of October and during the time of his absence, routine and advisory work was conducted by the Botanist assisted by the Technical Assistant in the Entomological Division. The events of entomological interest mentioned in his report deal only with pests observed while he has been in the Island, the Botanist recording his observations in the report of his activities.

During the period he has been on leave, the Entomologist has had interviews with the Agricultural Advisor to the Colonial Office, with Sir Guy Marshall, Director Imperial Institute of Entomology, and Mr. Simmonds, Government Entomologist for Fiji; when outstanding entomological problems of local interest were discussed.

Banana.—Considerable advance has been made with regards to the project of introducing a natural enemy into Jamaica to control the Banana borer, *Cosmopolites sordidus*, Germ.

Sugar Cane.—Statistical investigations re nodal infestation by *Diatraea saccharalis*, F., amongst the seedlings grown in the Experiment Station have shown a maximum of 9% nodal infestation among the Co. 281.

Citrus.—The role of the Giant toad, *Bufo marinus* in controlling the Fiddler beetle is explained.

Tobacco.—Comments are made with regards to pests attacking this crop which from the entomological standpoint is being kept under close observation.

Truck Crops.—Pests of special interest found attacking those crops during the winter months are enumerated.

W. H. Edwards,
Government Entomologist.

Summary of the Report of the Agricultural Chemist.

Soil Investigations.

The soil investigations undertaken during the year by the Division of Agricultural Chemistry included a soil survey of certain areas in Lower Clarendon. Five main types of soil differing widely in characteristics and agricultural value occurred within the area under survey. Texture variations within the types are considerable.

An advisory report was made on soil conditions in the Cayman Islands as demonstrated by certain soil samples obtained by the Entomologist.

Soils of the Terra Rosa type occurring on the White Limestone plateaux of Jamaica have received considerable study, particularly from the cultural standpoint. The limiting factor in crop production on these soils has been their low nutrient status and the inability of crops growing on them to withstand dry periods. The study has been conducted with the object of overcoming both these factors, first by systematic mulching and secondly by the application of the correct artificial manures.

The effect on Jamaica of denudation of hillsides and the subsequent erosion of soil has been examined. The most seriously affected soils are those of the Blue Mountain Range and of the White Limestone

outcrops. Suggestions of precautions for minimising the effect which can be applied to Jamaican conditions have been made.

The Division is now required to report on soil conditions in areas proposed for Government Land Settlement Schemes. The Survey work in this direction has been undertaken by the Agricultural Superintendent attached to the Division.

Soil problems of all types, but mainly referring to crop failure or to artificial manuring programmes have been investigated during the year.

Agricultural Analysis.

The number of samples of agricultural materials submitted for analysis is greater than for previous years. Samples of mixed fertilisers and of irrigation water formed the greater proportion.

Sugar Cane.

The field experiments on sugar cane have been continued. Two further variety trials have been laid down, but it has been necessary to reduce the number of manurial experiments undertaken. The collection and analysis of sugar cane yields has been continued and the results from the 1934-35 crop records published in a Departmental Bulletin. During the cropping period all sugar factories submitted their weekly results to the Division which were summarised and circulated. Monthly reports were also received and circulated.

A Jamaican Association of Sugar Technologists was formed towards the end of the year. One meeting of the Sugare Advisory Committee was held.

Citrus.

A comprehensive manurial experiment has been commenced at Grove Place on the terra rosa. Preparations have been made to establish a second experiment in Bog Walk area. The small trials in St. Mary have been continued. The maturity test has been applied to samples submitted by Produce Inspectors.

Bananas.

A series of manurial experiments have been commenced on land leased by the Department in various banana growing centres of the Island. The experiments in St. Mary suffered severely from hurricane and drought and have been abandoned. They are producing, however, valuable data with regard to the spread of Panama Disease. The use of fertiliser on bananas is becoming general and while undoubtedly a considerable amount of money is being wasted through the incorrect application or the use of unsuitable fertilisers, satisfactory results have been reported by certain planters who have followed a systematic manurial programme.

Ecological conditions relative to the spread of Cercospera Musae have been studied in Central America and in Jamaica.

Coconuts.

The soil of two areas in which coconuts were not growing satisfactorily were examined.

Other Crops.

A combined varietal and manurial experiment on Irish Potatoes was conducted at Grove Place.

Several problems connected with the tobacco extension scheme were investigated in collaboration with the Tobacco Specialist.

A small trial was conducted on diseased pimento trees.

Miscellaneous.

Co-operation has been established between the Division and the major firms supplying fertilisers to planters.

Advisory work mainly concerned with manurial treatment of crops has formed a considerable proportion of the work of the Division.

Articles have been contributed to the Journal of the Agricultural Society.

H. H. Croucher,
Agricultural Chemist.

Summary of Report of Government Botanist.

Weather.—Weather conditions proved more favourable for the production of viable banana seed during 1936 than in the previous year. As usual, wind resulted in some loss of pollinated stems, amounting to 5% as compared with a loss of 24% in 1935.

Breeding.—Destruction of breeding plants by the winds of the autumn of 1935 caused a slowing up of breeding work in the early part of the year; nevertheless during 1936, 2,260 stems were pollinated, being an increase of 15.5% over last year. This resulted from the commencement of operations on a further $2\frac{3}{4}$ acres of breeding material planted in 1935. A summary of the work being carried on at the different breeding plots is given with details of proposed extensions amounting to about 2 acres and projected crosses with new parental types.

Crosses carried out in previous years have been continued and work with the wild type *M. sapientum* var. *brachycarpa* has commenced. A falling off of the seed yield and germination is noted and is explained by the losses of pollinated fruit at the end of 1935. 191 new seedlings have been produced during the year; 173 have been established in the field, an increase of nearly 100%, these latter include many left over as very young seedlings from last year. Seedlings from the cross Highgate *M. acuminata* continue to show promise, but the backcross of F1. seedlings to 'Gros Michel' promises little of economic interest.

Cytology.—Chromosome counts of the seedlings produced have been continued. 232 seedlings have been so dealt with, a considerable increase in this branch of the work. The results fully confirm those previously reported and have proven valuable in determining unprofitable breeding lines. Work on pollen germination *in vitro* is briefly mentioned.

Seedlings.—Variety trials of the immune seedlings S.7, S.17, and S.19, have been continued through further ratoons and the acreage of S.19. under trial has been extended to provide more fruit for cold storage experiments. Shipping trials of *M. cavendishii* have been completed and only a sufficient acreage to maintain a stock of suckers has been retained. The discovery of a new sport of the 'Gros Michel' is recorded. Trials designed to test the resistance of new seedlings to Panama Disease have been continued and extended and improvements in the technique employed are summarised. Two more seedlings have proven susceptible.

Papaw.—Of 9 more strains of *Carica papaya* tested for reaction to mosaic disease all were susceptible. This search for a parental resistant type has been extended to include other species of Carica of which six are now undergoing test.

Insect Pests.—A resumé of the activities of the Entomological division covering the period during which I acted as Government Entomologist is given. No serious outbreak of pests occurred during that period.

L. N. H. Larter,
Government Botanist.

SECTION II.—WORK OF THE DEPARTMENT OF AGRICULTURE.

A. Public Gardens.

(i) *Report of the Superintendent and the Horticulturist.*

1. Hope Gardens.

The Horticulturist resumed his duties in the Department on January 20th after spending 6 months leave in England.

Weather.—The rainfall for the year which was 56.94 inches was above the average for the past 55 years. The rainfall was nicely distributed throughout the year and no damage was done by flood rains. In July there was a severe thunderstorm over the Gardens when two clumps of Travellers' Tree (*Ravenala madagascariensis*) and one *Erythrina umbrosa* were killed by lightning in the Wild Garden.

Orchids. A number of new varieties of Calanthes was purchased from Mr. W. Cradwick, Mandeville, for the Orchid collection with the object of enlarging the stock of this useful winter-flowering orchid for exhibition in the Orchid House during the Tourist season. The orchid collection was also enlarged by contributions of other species from private orchid growers in the Island.

Orchid seedlings.—The seedlings which were germinated by the asymbiotic method during 1931-32 continue to make satisfactory growth and there are now signs of a number of the earlier crosses coming into bloom in the early part of 1937.

Dahlias.—The Director of the Royal Botanic Gardens, Kew, and the Superintendent of the Royal Parks, London, kindly presented to the Department a collection of dahlias of the dwarf and semi-dwarf varieties for trial under local conditions. The dwarf varieties of the Coltness Gem class failed to develop the free-flowering habit so much admired in that type of dahlia. The semi-dwarf varieties were more satisfactory and flowered freely.

It is only within recent years that the dahlia has been grown in the lowland gardens. In consequence of the results obtained with the larger flowered varieties the dahlia has now become a popular garden plant on the plains, while in the past it was thought that it could only be grown with any hope of success in the hill districts.

Flower Beds and Borders.—The flower beds on the main drive were maintained in a floral setting throughout the year by a successional planting of annuals and perennials. Poinsettias in variety were successfully grown in a number of these beds in a dwarf state for ornamental effect from November to April. New beds were laid out on the main lawns and planted with gladioli and *Coreopsis grandiflora.*

Talipot Palms.—Two specimens of the *Corypha umbraculifera* flowered in the border to the south of the main lawns during the year. These specimens were seedlings obtained from the palm which flowered in Bath Gardens in 1902.

Main Avenue.—Further progress was made in the development of the lands adjoining the main avenue by clearing the Guinea grass from a section of the land on the western side and planting Bahama grass for lawn effect.

New Band Stand Site.—The ornamental section of the Gardens was extended by approximately one and a half acres to provide space for the erection of a band stand and to accommodate the public. The extension is to the north of the Wild Garden and looks on to the Liguanea hills. Flower beds in which a variety of dwarf annuals are grown have been laid out around the band stand. The channel which passes near the band stand has been developed into an ornamental feature by planting various flowering and foilage plants along the banks and by constructing a rustic bridge to allow visitors to pass from one lawn to another.

Introduction and Exchange of Plants.—A wardian case of plants including new introductions to the flora of the Island was received from the Royal Botanic Gardens, Kew. The plants were selected by the Horticulturist on the occasion of his visit to Kew Gardens during 1935.

An assortment of native ferns, including Filmy ferns, was collected by the Horticulturist in the Blue Mountains district and shipped to Kew in exchange.

Removal of Nursery.—The site adjoining the Plant houses where the sales nursery had been situated was cleared to accommodate the aviary bequeathed to the Government by the late Hon. A. E. DaCosta, O.B.E. The sales nursery is now situated in the nursery enclosure near the Foreman's Office.

Parking Square.—The parking square was extended to provide more accommodation for motor cars bringing visitors to the Gardens. The Public Works Department macadamised the parking square and tar sprayed the surface.

Water Lily Tank.—A rough stone facing was built around the outside wall of the lily tank in the sunken garden to make its appearance more in keeping with the design of the walls of the sunken garden.

Constant Spring Hotel.—This Department was requested to undertake the laying out and planting of the grounds around the new swimming pool at the Constant Spring Hotel. Beds were planted with Poinsettias and Coleus which developed into a pleasing effect by the end of the year when the hotel opened for the tourist season. A group of young coconut palms was planted on the north and west sides of the swimming pool.

The coconut palms were presented by Capt. John Hamilton of Potosi Estate.

Floral Exhibitions.—The Public Gardens staged a non-competitive group of cut flowers and foliage plants at the Jamaica Horticultural Society's Flower Show which was held at the Mico College on March 17th and 18th, 1936. A non-competitive exhibit of cut flowers was also staged at the Manchester Horticultural Show held at Mandeville on June 23rd.

Band Concerts.—A concert was given by the band of the German cruiser "Emden" on Sunday March 29th by the kind permission of the Captain. There was a very large attendance at this concert. His Excellency the Governor and party were present.

The new band stand was opened by His Excellency the Governor Sir Edward Denham on December 6th. There was a large attendance. It is proposed to have band concerts on the first and third Sunday afternoons of each month.

Fern Gully.—Visits were made to this beauty spot and suggestions made for its improvement.

Buildings.—A garage constructed to accommodate six cars was put up near the Head Office by the Public Works Department.

A new seedling house, 27′ x 9′, was constructed in the nursery enclosure to provide shelter for young seedlings during the rainy season. The roof is covered with "Windolite," a glass substitute that admits ultra violet rays.

Palisadoes.—The Superintendent of Public Gardens was appointed a member of the Committee appointed by the Governor to report and advise on the future development of the Palisadoes and Port Royal. Several visits were made and a report by the Committee forwarded to the Government.

During the year plants of Ackee, Cassia siamea, Coco plum and Almond were planted along the Palisadoes Road.

Special Visits.—The Superintendent visited and inspected Stokes Hall and reported on its suitability for Government Land Settlement Scheme. He also visited Greenwich Farm and reported on its suitability for growing vegetables.

Botanical Specimens.—During the year a large number of botanical specimens was supplied for the Cambridge Local Examinations, Junior and School Certificate, and also the University of London Matriculation Examination.

Visitors.—Among the distinguished visitors to the Gardens during the year were Lord and Lady Cromer, Sir Claude and Lady Russell, the Right Hon. David Lloyd George and Sir John Maffey.

Correspondence.—During the year 2,012 letters were received in this office and 1,019 letters were sent out, not including stereotyped circulars which are sent in reply to letters in connection with purchase of plants, and replies to inter-departmental minutes.

Lectures.—At the Agricultural Short Course for Agricultural Instructors the Superintendent gave a lecture on the new varieties of sugar-cane and also gave demonstrations in the Experiment Station.

The Horticulturist gave a lecture on "Landscape Gardening in relation to Home Decoration."

Meetings.—The following meetings were attended by the Superintendent of Public Gardens

January: Staff Conference at Farm School.
February: Meeting in the Director's Office with reference to the Tobacco Industry.
July: Meeting at opening of the Summer Course at Farm School, also the course of lectures.
August: Meeting of the Sugar Advisory Committee.
November: Meeting at the offices of the Jamaica Imperial Association in connection with visit to Puerto Rico.
Meeting for the purpose of forming a Sugar Technologists Association.

The following meetings were attended by the Horticulturist.

February: Meeting in the Director's office with reference to Tobacco Industry.
July: Meeting at opening of the Summer Course at Farm School, also the course of lectures.

Routine Work.—The routine work of the maintenance of the Gardens and the propagating and distribution of nursery stock was regularly attended to.

PLANTS DISTRIBUTED FROM HOPE GARDENS, 1936.

Sold.

Economic Plants—	
Coffee	10,605
Cacao	50
Citrus seedlings	9,797
Citrus, budded plants	232
Mango, grafted plants	656
Miscellaneous	1,635
	22,975
Ornamental Plants	17,416
	40,391

Free Grants.

Economic Plants—	
Coffee	1,386
Citrus seedlings	3
Citrus, budded plants	69
Cane tops and cuttings	139,228
Timber Trees	11,957
Miscellaneous	518
	153,161
Ornamental Plants	4,741
	157,902
Total Number of Economic Plants	176,136
Total Number of Ornamental Plants ..	22,157
Total Number of Plants distributed ..	198,293

The following statement shows the distribution of plants for the past five years from the Nursery at Hope:—

	1936.	1935.	1934.	1933.	1932.	Total.
Coffee ..	11,991	19,192	12,116	8,656	15,891	67,846
Cacao ..	50	..	..	..	194	244
Citrus seedlings	9,800	4,177	1,603	6,358	52,740	74,678
Citrus, budded plants	301	282	1,256	859	1,122	3,820
Mango, grafted plants	656	336	975	1,520	865	4,352
Cane Tops and Cuttings	139,228	141,880	163,785	226,864	261,233	932,990
Elephant Grass Cuttings	..	..	600	500	9,500	10,600
Timber Trees	11,957	9,605	3,341	16,102	10,767	51,772
Miscellaneous Fruit and Economic Plants	2,153	2,378	3,239	12,187	8,373	28,330
Ornamental Plants	22,157	27,693	26,867	15,425	27,167	119,309
	198,293	205,543	213,782	288,471	387,852	1,293,941

2. Castleton Gardens.

Weather.—The rainfall for the year was 145.94 inches. During May there was a deposit of 32.47 inches which damaged the pathways through the Gardens and gravel had to be headed from the river to re-surface them.

Garden Shelter.—The garden shelter near the river was pulled down and a new structure erected in its place.

Routine.—The general routine work of billing lawns, cleaning flood drains, repairing pathways, forking and weeding borders and propagating plants for nursery sale was regularly attended to.

Plants Distributed form Castleton Gardens, 1936.

Sold.

Economic plants	143
Ornamental Plants	496
	639

Transferred to Hope.

Economic Plants	935
Ornamental Plants	6,968
	7,903
Total number Economic Plants	1,078
Total number Ornamental Plants	7,464
	8,542

3. Public Gardens, Kingston.

Victoria Park Lawns.—It is becoming very difficult to maintain the lawns in the Victoria Park without an adequate supply of water during the dry seasons when the average annual rainfall is only 30 inches. The law forbids the use of sprinklers at the time when water is essential for the maintenance of the lawns Sections of the lawns have to be replanted following the dry season only to die out again during periods

of drought. Under present conditions it is impossible to keep up a standard of maintenance in the Victoria Park in keeping with the amenities of a modern city and as long as there is no independent water supply for the Park there is very little hope of an improvement in the appearance of the lawns and flower beds during the dry seasons.

Treasury Site.—The plot of land known as the "Old Treasury Site" in Harbour Street which was maintained as a lawn, under the control of the Public Gardens, was taken over by the Tourist Trade Development Board to erect the new buildings for accomodating the Tourist Bureau.

Foreman's Office.—A wooden structure 8′ x 8′ was built to provide necessary accommodation for the Foreman in charge of the Kingston Gardens.

Routine Work.—The general routine of maintaining the Victoria Park, the lawns around the Public Buildings, the Memorial Square and Headquarters' House Garden was regularly attended to.

4. Hill Gardens, Cinchona.

The Horticulturist visited the Hill Gardens, Cinchona, and remained in residence for two weeks from August 13th to 29th.

An inspection was made of the Tea plots at Upper Buzza and Latimer's which had been cleared and pruned the previous year.

A general cleaning of the Gardens, pruning shrubberies and removing dead trees, was carried through under the supervision of the Horticulturist. The Gardens in general were satisfactorily maintained by the Foreman in charge throughout the year.

Buildings.—Reports have been made on the dilapidated condition of the plant houses and the covering to the water storage tank which supplies water for domestic requirements, but so far no repairs have been carried out.

Christmas Trees.—Owing to the denudation of the Forest at Cinchona the system of supplying Christmas trees to the Public was discontinued.

Miscellaneous.—The usual demand for tree fern roots for potting material, moss and miscellaneous plants was supplied from Cinchona.

5. King's House Gardens and Grounds.

Bulbs and Flower Seeds.—One thousand Gladioli, large flowering dahlia tubers and an assortment of seeds of annuals were purchased for the flower garden. Lady Denham while in England selected a variety of seeds and bulbs for growing in the garden.

Tennis Court.—The two tennis courts near the Ball Room were resurfaced and are now in good playing condition.

Improvements.—A semi-circular excavation was made in the rose garden between the sundial and the sunken garden to open out the view into the sunken garden.

The Acalypha and Chinese Bamboo hedge around the annual garden was dug out and replaced with the Japanese Cap (*Holmskioldia sanguinea*).

Lily Tank.—The lily tank was cleaned out on two occasions. The one-inch outlet pipe was continually being choked and this was dug out and replaced by a three-inch galvanised pipe.

Kitchen Garden.—An assortment of fresh vegetables was grown to supply the domestic requirements of King's House.

Pastures.—The pastures under the care of Mr. Harold Bolton and Mrs. J. A. Crooks were maintained in satisfactory condition. The pastures under the control of the Department were cleaned during the year and the fences kept in good condition.

Permission was given by His Excellency the Governor to the St. Andrew Police to fence off and use a portion of the mule pasture as a recreation ground.

Routine.—The general routine work of billing and mowing lawns, repairing pathways, forking and weeding borders, renewing and making flower-beds and propagating plants was regularly attended to.

6. Gordon Town.

The small garden at Gordon Town was maintained in a tidy condition out of the Hope Gardens Maintenance vote.

7. Bath Gardens and Nursery (St. Thomas).

Mr. Glen Campbell, Inspector of Plant Diseases, is in charge of this garden and nursery.

Nursery.—The coffee nursery has been maintained and seedlings will be available during 1937.

Flower beds.—Several flower beds were remodelled and planted with varieties of canna and coleus and other shrubs supplied from Hope Gardens.

Summary of Plants Distributed by the Department during the last Five Years.

	1936.	1935.	1934.	1933.	1932.	Total.
Coffee	11,991	19,192	12,116	10,356	15,891	69546
Cacao	50	..	..	..	419	469
Citrus, Seedlings	9,900	4,177	1,603	6,358	52,760	74,798
Citrus, budded plants	301	282	1,256	859	1,122	3,820
Mango, grafted plants	656	336	975	1,520	865	4,352
Cane Tops and Cuttings	139,228	141,880	163,785	226,864	261,233	932,990
Elephant Grass cuttings	..	..	600	500	9,500	10,600
Timber Trees	11,957	9,605	3,341	16,102	10,767	51,772
Miscellaneous Fruit and Economic Plants	2,196	2,414	3,429	14,147	8,463	30,649
Ornamental Plants	22,653	28,094	26,867	22,746	28,141	128,501
	198,932	205,980	213,972	299,452	389,161	1,307,497

9. The Plantation and Garden Sales for the last five years have been as follows:—

	£	s.	d.
1936	387	7	11
1935	375	4	8
1934	509	13	1
1933	550	8	6
1932	613	1	9

10. The rainfall at the various Gardens for the year under review is as follows:—

	Hope Gardens.	Castleton Gardens.	King's House Gardens.	Public Gardens, Kingston.	Hill Gardens, Cinchona.
	Ins.	Ins.	Ins.	Ins.	Ins.
January	.27	4.72	.23	.65	2.64
February	.72	6.95	.44	1.28	2.46
March	.60	2.20	.58	.18	3.30
April	1.47	9.10	..	.97	4.14
May	13.31	32.47	14.77	8.89	17.78
June	12.16	13.13	9.41	14.79	18.09
July	2.18	8.36	1.22	1.17	8.23
August	7.41	16.59	5.68	3.73	11.23
September	10.40	15.48	5.61	1.20	11.80
October	5.28	8.11	8.00	3.85	9.96
November	1.53	10.56	2.21	.61	5.82
December	1.60	18.27	2.17	1.12	7.25
	56.94	145.94	50.32	38.44	102.70

Rainfall for the Five Years 1932-1935.

Year.	Hope Gardens.	Castleton Gardens.	King's House Gardens.	Public Gardens, Kingston.	Hill Gardens, Cinchona.
1932 ..	50.15	142.25	34.05	23.58	78.84
1933 ..	113.28	298.20	50.93	74.52	170.42
1934 ..	58.17	183.61	44.55	26.33	95.85
1935 ..	53.75	189.10	44.03	27.78	84.64
1936 ..	56.94	145.94	50.32	38.44	102.70

11. Contributions to the Gardens have been received from the following:—

LOCAL.

N. J. Sorapure, Port Maria.
Mrs. P. Trench, 12 Ruthven Road, Cross Roads.
Wm. Cradwick, Mereworth, Mandeville.
Stuart Black, Widcombe, Liguanea
Est. late Hon. Altamont daCosta, O.B.E.
R. S. Martinez, Hopefield Ave., Halfway Tree.
Capt. Rutty, Manor House Hotel, Constant Spring.
G. C. Gunter, 6 Barbican Road, Liguanea.
Chas. Williams, Williams' Nursery, Cross Roads.
Adam Pullar, 49 Arnold Road, Kingston.
John Lockett, 2 Devon Road, Halfway Tree.
D. J. Verity, "Davton," Cross Roads P.O.

FOREIGN.

Dr. M. Grabham, English Rooms, Madeira.
G. Telkamp & Sons, England.
Royal Botanic Gardens, Kew, Surrey, England.
Irving B. Levi, 6 Fenimore Road, Scarsdale, N.Y.
F. G. Walsingham, Cienfuegos, Cuba.
D. M. Jackmann, 212-15 39th Ave., Bayside, N.Y.
Miss Ellen Williams, Honolulu, T.H.
Curator, Botanic Gardens, Christchurch, New Zealand.
Institute of Paint and Varnish Research, 2201 New York Ave., N.W., Washington.
State Forest Service, New Zealand.
Director, Agricultural Experiment Station, Puerto Rico.
Vilmorin-Andrieux & Cie, Paris, France.
Alan Kelso de Montigny, Puntarenas, Costa Rica.

M. S. GOODMAN,
Superintendent of Public Gardens.
E. J. DOWNES,
Horticulturist.

B. AGRICULTURAL EXPERIMENTS, EDUCATION AND FIELD SERVICES.

(*ii*) *Report of the Superintendent Experiment Station, Hope.*

Weather.—The rainfall for the year under review at the Station was 56.94 inches, slightly above the average for the past 55 years. This was well distributed over the year. The first three months of the year was dry but the plants did not suffer to any extent as a small quantity of water was obtainable for irrigation.

Reservoir. -The pipe line from the Reservoir was completed by the Public Works Department during the year.

Distribution of Cane Varieties.—During the year 139,228 tops and cuttings of the different varieties of sugar cane were distributed, making a total of 4,829,163 tops and cuttings distributed free to estates and small cane farmers for the past seventeen years.

The following is a list of the varieties and quantities distributed for the five years 1932-1936.

Varieties.	1936.	1935.	1934.	1933.	1932.	Total.
P.O.J. 2878	73,273	58,961	73,449	74,869	112,538	393,090
Uba	30,324	22,948	11,850	22,797	31,200	119,119
May. 28	11,695	792	12	..	..	12,499
F.C. 916	11,099	699	..	..	..	11,798
P.O.J. 2725	2,597	11,953	26,492	52,032	57,179	150,253
E.K. 28	2,116	3,485	2,784	6,175	4,804	19,362
P.O.J. 2714	2,078	12,262	18,548	21,701	24,707	79,296
White Transparent ..	1,364	1,272	3,773	2,878	1,196	10,483
P.O.J. 2727	1,142	10,612	9,178	22,922	21,807	65,661
Co. 213	850	1,000	500	200	500	3,050
Co. 281	850	1,000	500	200	500	3,050
S.C. 12/4	511	864	3,808	3,675	2,659	11,517
B.H. 10/12	506	4,591	2,315	5,135	1,012	13,559
B. 726	505	9,197	6,764	4,315	400	21,181
Mexican Striped ..	312	300	824	208	836	2,480
Ba. 11569	6	1,544	1,121	620	460	3,751
H. 109	..	400	200	36	12	648
B. 417	..	..	1,255	5,036	998	7,289
B. 891	..	..	412	4,015	400	4,827
Badilla	..	..	..	50	25	75
	139,228	141,880	163,785	226,864	261,233	932,990

It will be seen from the above list that the demand again this year, for those varieties which are highly resistant to Mosaic Disease is far in excess of the demand for the more susceptible varieties. Small settlers, when applying for cane varieties, are supplied with those which are highly resistant to Mosaic Disease.

Cane Varieties.—The following varieties were received from the Central Plant Quarantine Station Trinidad, on May 4th.

B. 2935, B. 3013, B. 3124, B. 3127, B. 3138, B. 3234, and B. 3439. Some of these varieties reached us in very poor condition and the B. 3138 failed to germinate. All these varieties appear very susceptible to Mosaic Disease and after continual roguing to keep them free from Mosaic very little material was available for replanting.

On June 30th four seed pieces of the May. 63 was received from the Central Plant Quarantine Station.

Mayaguez 28.—Large quantities of this variety have been distributed both to Estates and small cane farmers. There should be sufficient material on the sugar plantations to plant out several hundred acres during 1937. The appearance of this cane on most estates is very promising. It is rather a slow grower for the first few months of growth as it stools vigorously, thus covering over the land quickly at a very early stage in growth and saves several weedings. It appears to be highly resistant both to Mosaic Disease and Root Disease. This cane seems to be able to adapt itself to almost any type of soil. From observations, in comparison with other varieties in the Station, during the early part of the year under review when the rainfall was very low, this cane showed much more resistance to drought than any of the other older varieties.

Fajardo Central 916.—A large quantity of planting material of this variety has also been distributed to the Estates and small cane farmers. There should be sufficient planting material available on the estates to plant out several hundred acres of this cane during 1937. It is a good germinator and a very quick grower but does not stool until later in growth. It does not cover over the land quickly enough to save weeding as in the case of the May. 28. It appears to be fairly resistant to Mosaic Disease but from observation on two estates it seems not to be able to stand up to root disease or excessive moisture. It appears to be a good ratooner and drought resister.

P.O.J. 2878.—Large quantities of planting material have been distributed to small cane farmers and there is a big demand for cuttings of this variety among this class of cultivator. It is an excellent cane for small settlers as it is highly resistant to Mosaic Disease. The habit of this cane to develop shoots over a long period makes it suitable for the small cane farmer who makes his own sugar in open batteries. This class of small cultivator only reaps those canes that are mature and leaves the shoots to develop. He manufactures sugar several times during the year.

The varieties P.O.J. 2725, 2727 and 2714 have been distributed in small quantities. There has been no great demand for them.

B. 726.—Owing to this variety being very susceptible to Mosaic Disease there has been no demand for planting material. A plot of B. 726 growing on a heavy clay soil did not thrive and became heavily infected with Mosaic Disease. This was dug out, the land cultivated and planted with May. 28 and F.C. 916. These varieties are making good growth in this heavy clay soil.

An old plot of E.K. 28 ratoons was dug out to make room for the extension of the new varieties mentioned above.

Pigeon Peas.—The four varieties: Variety New Era Strain "X," Variety New Era Strain "D" Variety Local Grey and Variety Prensado which were growing in the old banana plot gave poor yields The variety Local Grey gave the best yield. After the crop was reaped in January this year half the plants in each plot were cut back to within 12 inches of the ground to ascertain if this would have any effect on the ratooning. Unfortunately for eight weeks after the plants were cut back there was practically no rain and although all the stumps sprouted into growth most of them died. The few that survived, when they fruited this year, did not show any increase over the plants that were not cut back. This might have been caused by the check they received after being cut back during the drought.

Seeds of the above varieties are now available for distribution in small quantities.

Citrus.—Budding of the Navel Orange was continued this year but the demand for these plants is small. The old citrus grove which had served its usefulness and was becoming harassed with gummosis was dug out. This space has been levelled and made into a parking space to accommodate cars during band concerts in the Gardens.

The young citrus grove to the west of the old grove has been fenced round. During the early part of the year such crops as Bengal Bean, Bush Velvet Bean, Jerusalem Pea, Overlook Bean and Crotolarias were planted through the plot. These made a heavy growth of material during the spring and summer months. In December they were dug up and ploughed in during January.

The Eddie Wasp (*Eretmocerus serius, Silv.*) continues to keep the groves and young budded plants practically free of the Black Fly.

Coffee.—The coffee plot gave a fair yield this year. The plot was forked and mulched during the year.

Mango.—A large quantity of budwood was distributed this year. Several grafted Bombay trees were cut back to encourage rapid growth of young wood so that we could be better able to meet the demand for budwood.

Several trees in the mango grove were destroyed to allow space for erecting a band stand.

Vegetables.—Seeds of varieties of Vegetable Marrow and Squash were sent from the Low Temperature Station to be tested. It was rather late in the season when these seed were received. They made good growth, but their fruiting was disappointing owing chiefly to the time of planting, as the season for planting vegetables in the Plains had almost passed.

Perilla ocymoides seeds were received from the Institute of Paint and Varnish Research, U.S.A., and sown in the Station, but the seeds did not germinate.

Diseases.—There was little evidence of Mosaic Disease with the exception of a plot of B.726 which was planted in unsuitable soil.

Insect Pests.—There was little evidence of the attack of Moth Borer in the Station.

Thrips.—Again this year there was a severe attack of thrips on the Pigeon Pea varieties which reduced their bearing considerably.

Minor repairs to roads and pathways were done during the year and the Station kept in a tidy condition.

M. S. Goodman,
Superintendent Experiment Station.

(*iii*) *Report of the Superintendent of Sugar-cane Experiments.*

Puerto Rico.—Two members of the Sugar Manufacturers' Association (of Jamaica) Ltd., the Hon. F. M. Kerr-Jarrett and Mr. L. B. Whitaker, and myself left Jamaica on October 6th, on a visit to Puerto Rico with the object of investigating the marked improvement in the yield of sugar per acre in that island over the past five years.

Five years ago this was as low as 2 tons of sugar per acre and now it is averaging between five and six tons per acre, with some cases where it has gone as high as eight tons per acre.

In our opinion the above noted improvement has been brought about by growing a crop of healthy canes which have had no checks to growth due to lack of water or plant foods and from which all sucker growth have been eliminated. This has been brought about

(1) By the elimination of Mosaic Disease from the BH 10/12 cane which is still considered the best variety available, by drastic roguing and rotating with resistant varieties chiefly P.O.J. 2878, May. 28. F.C. 916, P.R. 803 and P.R. 807, and by discarding varieties that are susceptible to Gumming disease

(2) By close planting consisting of four feet between furrows and the use of (on the average) 20,000 seed pieces per acre, depending on single or double planting.

(3) By the application of 600-800 lbs. of complete fertilizers varying from 12:6:8 to 14:6:14 and following this after about four weeks with 400 lbs. sulphate of Ammonia and in some cases a further 400 lbs four weeks later, the last application never being delayed beyond 8 months prior to cutting.

(4) A rainfall of 30-80 ins. per annum can be counted on, and even at the latter figure irrigation is regularly applied, bringing the total application of water when possible to 150 inches per annum, so as to ensure that the fertilizer acts at once and there is no check to growth.

Great attention is also paid to drainage to ensure that this heavy application of water is used to the best advantage, and complete soil pulverization is carried out prior to planting.

The result of the foregoing factors is to ensure a heavy and vigorous growth of cane from the outset which is maintained without check during the growing cycle. As a result late suckering is impossible so that all canes cut are fully ripe and mature and contain the maximum sugar content.

I beg to put on record my deep appreciation of the assistance given us by the Director of Agriculture, Dr. Lopez Dominguez, and his staff, also of the information given us by the Officers in charge of the centrals which we visited.

We returned to Jamaica on October 20th,

Weather.—The rainfall during the year under review was about the average and was nicely distributed throughout the year, with one exception, Trelawny, where the rainfall for the first six months of this year was far below normal. There were no flood rains in the cane areas that did any damage.

Production.—The output of sugar for the 1936, according to the Sugar Board, was 91,463 tons. This is the largest production of sugar in any one year to date. This does not include the amount of wet sugar made by small settlers which is sold only in the local markets. The amount of wet sugar made varies so greatly from year to year that it would be impossible to attempt an estimate of the amount made during 1936.

Owing to favourable seasons and well distributed rainfall during 1936, it is estimated that the 1937 crop will be above 100,000 tons of sugar.

The purity and sucrose of the juice were better during 1936 than they had been for many years and several factories finished reaping, taking only a little over 8 tons of canes to make a ton of sugar.

Varieties.—The demand for planting material of the Mayaguez 28 and Fajardo Central 916 was very high and an effort was made to meet the demand. Some estates will have enough planting material during the planting season of 1937 to plant out 100 acres in these varieties. The nurseries of these varieties are very healthy looking and very encouraging in appearance.

The B.H. 10/12 is still considered in the districts where long ratooning is practised to be the most suitable and general purpose cane for the large cane farmers in most of the cane districts. On rich, deep, alluvial soils it is considered by far the best ratooning variety in the Island. And from the point of view of sucrose and purity of juice there is no variety that can claim a better juice if it is reaped at its correct stage of maturity.

P.O.J. 2878 is still being planted on a fairly large area, but this cane is only good as plants and first ratoons. After this period the canes become small and light and the tonnage of canes per acre drop rapidly. As a plant cane the tonnage per acre is equally as good and in some instances better than the B.H. 10/12, the standard cane. On estates where Mosaic Disease is troublesome to control it is advisable to grow this cane in preference to B.H. 10/12.

P.O.J. 2725 is being replaced on most estates by P.O.J. 2878 owing to its poor ratooning qualities. This cane is also often attacked more severely by moth borer than any of the other varieties.

P.O.J. 2727 is generally grown in the low rainfall areas where it gives a fair tonnage of cane per acre and the juice is of high purity.

E.K. 28, grown on some of the estates on the north side of the Island, has given good results. This cane used to do well in Vere.

S.C. 12/4 is gradually disappearing from cultivation owing to its susceptibility to Mosaic Disease and its poor ratooning qualities.

Other varieties such as B. 726, Co. 213 and Co. 281 are found growing in small areas but they are not fancied by planters.

Manurial and Other Experiments.—Manurial experiments were reaped at the following places: Duckenfield, Georgia, Holland, Richmond and Long Pond. The experiment at York was not reaped. Manurial experiments were continued at Duckenfield, Georgia, Holland and Richmond. Variety experiments were reaped at Plantain Garden River Estate, early and late reaping, and at Belle Isle late reaping. Cane variety experiments for early and late reaping were put down at Golden Grove and Money Musk.

Cultivation.—It is gratifying to report the interest that is being taken by planters in improving their cultivation wherever possible. The results of this is seen in the increase in the average tons cane per acre and the output in sugar for the past few years. Estates for the past four years have been importing more implements for the better cultivation of their soils. Visits to the Estates are really a pleasure when one sees the keen interest that is being taken generally in all works on the Estates. The low price of sugar is a handicap to the rapid improvements which the planters would like to carry out.

Extension.—During the year there has been no appreciable increase in acreage by the large cane farmers. The small cane farmer is increasing rapidly in some cane areas, and in some districts cane farming has to be restricted as the factories have reached their limit of production. In one large district owing to the ravages of Panama Disease of bananas it is contemplated putting all banana lands into cane cultivation and erecting a new factory which should increase the production of this area by about 10,000 tons of sugar.

Factories.—The new factory at Caymanas was completed in time to take off a portion of the crop. Other factories have also installed additional machinery to increase efficiency.

Yields.—The average tons of cane per acre has been gradually increasing for years. The sucrose and purity of the juice depend on the climatic conditions existing at the time of reaping.

Diseases.—Mosaic Disease was prevalent during the year in some areas and special visits had to be made in connection with its eradication. It appears that the carrier of the Mosaic Disease virus is very active under certain local conditions when there are these sudden outbreaks of the disease.

Root Disease was again very noticeable in small areas.

Eye Spot was very bad on an estate on the northside of the Island.

Insect Pests.—The Sugar-cane Aphis was again seen this year but only in small areas. It does not seem to be spreading to any extent.

The Moth Borer was not much in evidence this year. Several inspections of fields and of canes in the mill yard were made and the infection found was very small.

Visits.—Requests for special visits were received from a number of Estates. Five special visits were paid during the year to various Estates. These were either in connection with the outbreak of Mosaic Disease or some other disease which had been in the Island a considerable time but had not appeared before in that particular district. The Plant Pathologist and I made a special visit to an estate through a reported new disease which turned out to be an abortive growth at the growing point caused by a prolonged drought followed by heavy deluges of rain.

Periodical visits were also made to the Sugar Estates. Planters look forward very keenly to these visits when they put forward any little problems which they would like to discuss and which often prove very profitable to them. Planters when in Kingston also visit this Office to discuss matters of interest to them which do not necessitate a special visit of investigation to the estates.

M. S. Goodman,
Superintendent of Sugar-Cane Experiments

(iv) Annual Report of Headmaster of the Government Farm School.

I have the honour to submit my Annual Report of the Government Farm School for the year ending 31st December, 1936.

General.—The School completed a successful year's operations and an increased number of students were in attendance.

During the year there seemed to be more interest evinced in Agricultural Education generally, and a better type of student made application for admission.

The Farm School is now an institution at which young men interested in the study of agriculture can receive a thorough training, and the majority of students now entering, do so with the idea of going back on the land after completing the course.

Attendance.—During the year under review the average attendance at the School was 49 students, an increase of five over the previous year. The numbers in each of the three years were:—

Term.	Years.			Total.
	I.	II.	III.	
Easter	19	14	14	47
Midsummer	19	14	14	47
Christmas	22	17	14	53

The following figures show the average number of students at the School during the last seven years.

1930	57
1931	54
1932	41
1933	47
1934	44
1935	44
1936	52

The number of students in attendance during 1936 shows a greater number than any previous years since 1931.

Graduation—The Annual Graduation at the School was held on July 9th, when 14 Third Year Students were graduated. The following students were awarded Diplomas in Practical Agriculture:—

Name of Student.	Address.
Lindsay Vinton Ernest Burns ..	Cross Roads
Kenneth Osborne Anthony Campbell ..	Carron Hall
Alister Alexander Edwards	Chalky Hill
Hubert Selbourne Francis ..	Laughlands
Granville Ferdinand Forbes Gayle ..	Retreat
Bertram Blandford Green ..	Malvern
Austin Lancefield Kavanagh ..	Malvern
Colvin Alexander Long ..	Moneague
Donald Lester Marsh ..	Ocho Rios
Hugh Clarke Miller ..	Dallas
Wilfred Alfonso MacDonald ..	Pedro
Llowel Anthony McNichol ..	Enfield
Israel Asher Rhone ..	Bellas Gate
Stedman Edward Ricketts ..	Bluefields.

His Excellency the Acting Governor, Honourable C. C. Woolley, M.C., addressed the Graduating Class. Mrs. A. C. Barnes presented the Diplomas and Prizes.

There was a large gathering of parents and friends of the students present. An exhibit of work done by the students was held, and the visitors were shown over the School and Farm by the students.

Prize Awards—The Cup donated by the Director of Agriculture, Hon. A. C. Barnes, C.M.G., to the best all round student in the School, was awarded to Donald Lester Marsh, a Third Year Student. In awarding this Cup consideration is given to scholastic standing, ability on the Sports Field and interest taken in School activities.

The prize of One Guinea awarded by the Headmaster to the Student making the highest marks during the three years, in Animal Husbandry and Live Stock Judging, was awarded to Lindsay V. E. Burns, a Third Year Student, whose average over three years was 86.1 per cent.

The prize of a Cricket Bat donated by M. S. Goodman Esq., for the Student making the greatest progress in Cricket du ing the year was awarded to H. C. Miller, Dallas P.O., a Second Year Student.

Employment of Students.—It is encouraging to report that more students are finding employment than in the past, and there has been less difficulty in this connection than in previous years.

Curriculum.—The usual curriculum was carried out with the exception that Entomology was included in the studies for the Second Year Students. The addition of this subject rounds out the course in this year, and a well balanced course in practical and theoretical agriculture is now given at the School.

Third Years at Grove Place.—The Third Year Students spent half of each of the three terms at Grove Place, and received practical instruction in phases of agricultural work which cannot well be given at Hope. This system is working well, and gives the students an opportunity of carrying out work under estate conditions before finishing the course. The experience gained by the students while at Grove Place is most valuable.

Scholarships.—The two scholarships offered by the Department of Agriculture tenable at the Farm School fell vacant during the year. They were awarded to L. T. Binns of Cross Roads, and J. J. Searchwell of Port Antonio. There were 47 applicants for the two scholarships.

Experiment Station.—The School has now an Experiment Station consisting of four acres, which is well established in crops which are grown in the Liguanea Plain area. The Station is used for giving instruction in Field Crops and has well established plots of bananas, coffee, coconuts, citrus, pineapples

cane, cassava, sweet potatoes, tobacco. Such vegetables crops as Irish Potatoes, cabbage, tomatoes are also grown in season.

The work at the Experiment Station is seriously handicapped by the lack of a sufficient water supply, and until such a supply is available it will not be possible for the crops on the station to produce the maximum results.

Students Tours in the Country.—During the year the Third Year Students made several visits to estates and holdings in the country. While at Grove Place a Potato Field Day in the country was arranged for the students. When the students were at Hope a day was spent visiting the Jamaica Sugar Estates.

I wish to express my appreciation of the facilities granted to the students to visit, and be shown over the various properties and holdings.

Health of the Students.—The health of the students during the year was on the whole good. Fever and colds gave the most trouble, but no serious outbreak of disease occurred.

Student Christian Movement.—The Branch of the Student Christian Movement has a successful year, under the guidance of Mr. Hallett, Secretary of the Y.M.C.A. I wish again to express my appreciation of the interest taken in this work by Mr. Hallett.

On May 8th the students of the Farm School were "At Home" to the other branches of the S.C.M. in Kingston and St. Andrew. The third Year Students acted as guides and showed the visitors over the School and Stock Farm. after which refreshments were served.

Education Month.—The Farm School took part in Education Month which was held during the month of June. The School held an Open Day on June 16th when work done by the students was exhibited. The School also took part in the programme arranged by the Vocational Education Institutions at the Ward Theatre on June 16th, contributing a Display of Life Saving Exercises under the direction of Mr. D. J. Addis, Instructor in Drill.

Sports. The Annual Sports Day at the School was held on Wednesday, March 25th. The attendance was the largest in the history of the School and all events were well contested. Physical drill and gymnastics was given as outlined in the curriculum. The School entered a team in the Evelyn Cup Cricket Competition, and a team was also entered in the Third Division Football Competition. Friendly matches were also played in both cricket and football during the year. The annual Rugger Match for the Black Cup was played at the Farm School Grounds, between a team of civilians and a team from the Sherwood Foresters at Camp.

Old Boys vs. Present Boys Cricket Match.—On May 30th the Annual Old Boys vs. Present Boys Cricket Match was held at the School. About 50 Old Boys were present. The match resulted in a win for the Old Boys. This annual event provides an excellent medium for the Old Boys to keep in touch with the School.

Old Boys Association.—The Old Boys Association had a successful year, and did much to further the interests of the School. The annual meeting was held after the Old Boys vs. Present Boys Cricket March held on May 30th.

Extension Work.—Use was made of the Farm School to hold a number of meetings during the year, chief among these being the Annual Conference of the Department of Agriculture held on January 6th, and the Conference of Sugar Technologists held on November 27th. Arrangements were made in both cases for those attending to have lunch at the School.

The number of visitors showed an increase, both in the number of individuals visiting the School and the number of parties of either members of the Branch Societies of the Jamaica Agricultural Society, or of school children. Four parties varying from 24 to 62 in number and totalling 171 persons visited the School during the year.

Leave.—During the year Mr. L. A. Powell, Senior Assistant Master, was away from the Island on leave from June 30th to October 9th.

I take this opportunity of expressing my appreciation for the assistance and co-operation rendered during the year by the Staff of the School and by the various Branches of the Department.

J. W. Howe,
Headmaster.

(V) *Annual Report of the Farm Superintendent.*

I have the honour to submit my report for the Government Stock Farm for the year ending December 31st, 1936.

General.

The year under review was an average one for livestock on the Liguanea Plain. Due to the drought from November until April, pasture conditions at the beginning of the year were below normal. The total rainfall for the year was 56.87 inches, which was 3.15 inches less than 1935 when a total rainfall of 53.72 inches was recorded.

As in 1935, November and December were below normal in rainfall, the amount recorded in November being only 1.55 inches, which caused a pasture shortage. The pasture shortage became acute in the early part of the year, and in February it was found necessary to purchase cut grass for the dairy herd.

Livestock.

Numbers.—The total number of head of livestock on the Farm at the end of the year was 502, an increase of 27 over the previous year, when the total number of livestock on the Farm was 475. The total was made up as follows:—

	1936	1935	1934
Bulls	33	27	23
Purebred cows and heifers ..	42	46	50
Grade cows and heifers ..	387	364	313
Mules	23	23	23
Steers	13	13	14
Horses	4	2	1
	502	475	424

Value of Livestock.—The total value of the livestock on the Farm at the end of the year was £7,175 18s. 0d., being a decrease of £431 15s 0d. over the previous year, when the total value was £7, 607 13s. 0d. The price of livestock in the Island generally decreased during the year and this combined with drought conditions, which existed at the beginning of the year, tended to decrease the demand for livestock.

Purchases.—Only one animal was purchased during the year, it being the Red Poll Bull *Hope Boast*, which was purchased from Captain Harvey of Darliston. Unfortunately this animal contracted a chill on the way from Darliston to Hope and died within a week after its arrival.

Calvings.—The calvings during the year totalled 166, being 95 heifer calves and 75 bull calves. This is an increase of one over the previous year when 165 calves were dropped. Included in the total of calves dropped during the year are four sets of twins.

The calves dropped during the year were sired by the following bulls:—

Sires.	No. heifer calves.	No. bull calves.	Total.
Fon 70A (Purebred Jersey) ..	17	17	34
Double Folly (Purebred Guernsey) ..	19	7	26
The Mayor (Purebred Holstein) ..	9	11	20
Paymaster (Montgomery Jersey) ..	9	7	16
Glen's Prefect (Purebred Jersey) ..	10	5	15
Sir Francey Romeo Posch (Purebred Holstein)	5	6	11
King Ella Pietertje Gamble (Purebred Holstein)	7	3	10
Hope Foremost 6th (Purebred Guernsey)	3	6	9
Bees' Pusa (Montgomery Guernsey)	5	1	6
Foremost's Monogram (Purebred Guernsey)	2	4	6
Stanley (Montgomery Jersey) ..	3	2	5
Hope Foremost 3rd (Purebred Guernsey)	3	1	4
Eloquent Bandolier (Purebred Aberdeen Angus)	1	1	2
Unknown	2	4	6
	95	75	170

Number of calves to cows in milking herd.—The following figures give the number of the calves dropped during the year by the cows in the milking herd. One cow dropped her eleventh calf and thirty-eight heifers calved for the first time.

Cows used as foster mothers are not included in this list.

1st calvers ..	38	heads
2nd " ..	34	"
3rd " ..	20	"
4th " ..	20	"
5th " ..	14	"
6th " ..	7	"
7th " ..	9	"
8th " ..	3	"
9th " ..	6	"
11th	1	"

Health of Livestock.—The total deaths for the year amounted to 40, being 8 more than during the previous year.

Tuberculosis.—The herd was tested for tuberculosis in April and November. No reactors were found.

Sales of Livestock.—The sales of livestock for the year totalled 103 head, of which number 48 head were sold for breeding purposes, and 54 were sold to the butcher. Of the 48 head sold for breeding purposes the following breeds were represented:—

Grade Jerseys	20
Grade Guernseys	10
Grade Holstein	13
Purebred Jersey	1
Purebred Guernsey ..	2
Purebred Holstein	1
Grade Aberdeen Angus ..	1
	48

The demand for breeding stock was not brisk especially at the beginning of the year, with the result that some of the young calves were sold to the butcher for veal.

Milk and Butter Production and Sales.

Milk Production.—The total production of milk for the year amounted to 264,899.25 quarts, a decrease of 2,530.50 quarts over 1935. The daily average production for the herd was 725.7 quarts. The average daily production per head for the year was 5.00 quarts, being 0.20 quarts per head less than in the previous year.

Sales.—The sales of milk for the year totalled 221,207.25 quarts, an increase of 11,004.50 quarts over 1935. The requisitions of the Public Institutions have increased considerably during the last three years, and the Farm has at times found difficulty in supplying them.

Table showing Production and Sale of Milk.

Year.	Production (Quarts).	Sales (Quarts).
1936	264,899.25	221,207.25
1935	267,429.75	210,202.75
1934	254,448.90	196,971.25
1933	236,391.00	198.913.25
1932	222,923.00	186,924.50
1931	207,502.50	153,300.00

Butter.—A total of 1,984.75 pounds of butter were made during the year, which amount is 21.35 pounds less than last year when the total made amounted to 3906.1. The amount of milk required to produce 1,984.75 pounds of butter was 14,439 quarts, which gives an average of 7.2 quarts of milk per pound of butter. Sale for the butter was found at the Mental Hospital and the Farm School.

Production Records—Th total amount of milk produced by the herd for the year was 264,899.25 quarts. This amount was from an average of 144.7 cows, and gives a daily average production for the herd of 725.7 quarts. The average daily production per cow as 5.00 quarts for 1936 as compared with 5.20 last year, which is probably due to the lack of pasture at the early part of the year. The average butter fat content of the milk produced was 5.1% which is 0.10% in excess of last year. The following figures set out the production of the herd for the last five years.

Year.	Average No. cows milking.	Average daily production per cow (qts.)	Average daily yield for the herd (qts).	Average butterfat content%.
1936 ..	145	5.00	725.7	5.10
1935 ..	140	5.20	732.6	5.00
1934 ..	135	5.16	697.1	5.22
1933 ..	132	4.90	648.6	5.58
1932 ..	106	5.70	608.6	5.32

Production Averages by Breeds.—The following figures show the average production per head during the year of the various breeds raised on the Farm.

Breed.	No. Head.	Production (pounds).	Lactation period (days).
Grade Holstein	16	6,058.7	363
Purebred Red Poll	2	5,173.4	365
Grade Guernsey	49	4,524.7	324
Grade Jersey	39	4,404.0	315
Purebred Jersey	7	4,401.0	332
Grade Montgomery	11	3,985.4	299
Purebred Guernsey	2	4,399.7	361
Miscellaneous Breeds ..	16	3,878.0	389

Feed Purchased for Livestock—

The figures below show the amount of the various feeds purchased during the year.

Feed.	Amount used.	Weight per bag.
Coconut Meal	91½ tons	(Purchased locally)
Milk Powder	10½ tons	
Cottonseed Meal	650 bags	100 lbs.
Linseed Meal	265 bags	125 lbs.
Bone Meal	15 bags	100 lbs.
Fish Meal	5 bags	100 lbs.
Blood Meal	5 bags	100 lbs.
Oats	450 bags	136 lbs.
Bran	300 bags	100 lbs.
Rock Salt	32 bags	225 lbs.
Cow Chow (Purina)	15 bags	100 lbs.
Canes	595 tons (grown on estate)	

Public Stud Services.

The total number of cows sent to the stud bulls standing for public service at Hope during the year was 43. Of this number 25 were sent to the Jersey bull while the remaining 18 were to the Guernsey bull. The number of animals sent to the bulls was 15 less than for last year.

During the year a Guernsey bull, *Fanfare*, was sent to Llandewey in the parish of St. Thomas to stand for public service. It is expected that such a bull will do much to improve the type of dairy animal raised in that area.

Poultry.

Two breeds of poultry are kept at the Farm, namely, Rhode Island Reds and White Leghorns, and breeding stock, and eggs for hatching are sold to the public.

During the year the sales were as follows:—

	Rhode Island Reds.	White Leghorns.
Eggs sold for hatching	193	111
Baby chicks sold	80	..
Cockerels sold for breeding ..	5	8
Hens sold for breeding	10	..

Besides the stock and eggs sold for breeding purposes the Farm also supplied 284 dozen eggs for table use to the Farm School and the Public Hospital. Five cockerels culled out of the flock as unsuitable for breeding were sold for table purposes. The demand for breeding stock was slightly less than last year.

Crops and Feed.

Silage.—A total of 70 acres were planted to guinea corn for silage, and despite the uneven distribution of rainfall the crop was a good one. The crop was affected by rust, but was cut at an early stage of maturity and made a good quality of silage. The three silos were filled, and the corn which was left over was cut and used as a soiling crop in place of sugar cane.

Experiment with Guinea Grass Silage.—An experiment was conducted using guinea grass for silage. Two stacks each eight feet high and 16 feet in diameter were made of guinea grass cut green and made into bundles. In one of the stacks the guinea grass was used alone, but to the other stack was added a solution of molasses and water in the proportion of one part of molasses to three parts of water. This solution was sprinkled over each layer of bundles as they were placed in the stack. By using this solution it is hoped that it will be possible to get a better quality of silage due to a more satisfactory fermentation, and it will be possible in the drier areas of the Island to preserve guinea grass in the form of silage against the drought periods.

Sugar Cane.—During the year 595 tons of cane grown on the estate were used. The cane on the whole did well, and assisted the feed situation especially during the time of drought in the early part of the year.

Mangoes.—The mango crop was good and covered a longer period than in former years. The first mangoes were shipped on April 20th and the last shipment was made on August 4th. The total exported during the year consisted of 3,541 dozens.

The mangoes for export were packed and shipped through the Government Low Temperature Station, and brought good prices on the English market. The loss due to shipping was the lowest since the Farm commenced shipping mangoes.

The mango crop forms one of the main sources of revenue of the Farm.

Guatemala Grass—This is a variety of grass new to Jamaica, which was brought here by Messrs. Sutherland and Thelwell from Trinidad, Plots of this grass have been planted near the dairy buildings, and near the silos, and seem to be well established. It is not possible to state how drought resistant this grass is as yet, but if it is resistant to dry weather it will serve a very useful purpose as a fodder crop for all classes of stock. The grass is one which grows rank, and when full grown resembles cane.

Re-afforestation.—In 1934 attempts were made to re-afforest the Liguanea Ridge on the Farm. Seeds and seedlings of the trees grown in the district were planted. It was found that in the case of the seedlings the percentage of those catching was very low, and it was better to establish the trees from seed rather than seedlings. With this information in mind tree seeds were again planted during 1936, and it is encouraging to report that the ridges and hills are gradually being established in trees.

All the tenants were moved from the ridge area two years ago, and the fires which were so common in past years on the ridge during the dry season have greatly decreased in number.

Work of establishing the ridge in trees will be continued.

Buildings and Improvements.

Clipping Shed.—The clipping shed was moved from near the centre of the Farm over to the crush pen. Having it located there facilitates the handling of stock during clipping, and does away with having the stock brought to near the main buildings. While the clipping shed was being erected a shelter was also made over the crush pen in order to provide shade for those working with cattle when branding or testing for tuberculosis.

Garage.—The old clipping shed was converted into a garage for the truck, and it is possible now to house the truck near the centre of the Farm, instead of having it some distance away as in the past. A tool room and bench was made for the mechanic and a small room added for storing purposes.

Hay Shed.—As there is a considerable amount of hay from the Seymour Grass which is cut on the property every year, a shed 20 ft. by 30 ft. was built for storing purposes. This provides ample storage for the amount of hay made, and it has been found that such hay can be used to advantage during the dry weather. It is also most useful for bedding for the small calves during the wet weather.

Drainage Ditch.—Considerable trouble has been encountered with flood water flowing over that part of the Farm adjoining Hope Road at the Farm School gate. A drainage ditch was cut and the water is now carried to the natural drainage levels.

Litter Carrier.—Equipment was purchased from Canada so that an overhead track and litter carrier could be installed in the main dairy buildings. Preparations for the erection of such equipment were made but the equipment will not be installed until next year. It is planned also to erect a manure pit at the back of the buildings in order that the manure may be placed directly into the manure carrier.

General Repairs.—Repairs to the buildings and equipment were made as required throughout the year.

Extension Work.

Visitors.—The number of visitors to the Farm during the year increased. The number of tour parties of members of the Jamaica Agricultural Society and tour parties from the various schools increased. Tour parties varying from 24 to 62 in number and totalling 171 persons visited the Farm during the year.

Employees Football Competition.—In order to give the labourers employed in the Department an opportunity to play football, a competition was organized and five teams entered. The teams were Estate, Steermen, Dairymen, Ploughmen and Gardens. The men took a very keen interest in the Competition and matches were played at the Farm School Grounds every Wednesday afternoon. The Team made up of the Dairymen won the Competition and was presented with a cup kindly donated for annual competition by Messrs. D. H. Henderson & Company.

I wish to again express my appreciation of the loyal co-operation of the members of the Staff of the Farm and the other Branches of the Department during the year.

J. W. Howe,
Farm Superintendent.

(vi) Report on Grove Place Stud Farm and Experimental Station.

A. Weather.

Record Rainfall was registered at Grove Place during 1936, there having been 154 rain days with as many as 134.72 inches. In the flood year of 1933, 133.59 inches were registered, and the average annual precipitation for the past 5 years has been 106.27 inches.

During May and June the weather was tempestuous—high winds, heavy rains and thunder, with pastures and cultivation flooded.

There were only two dry days in May and a total fall of 38.19 inches.

Much damage to crops resulted from flooding and lack of sunlight.

B. Experimental Station.

Sections A (Nursery, Banana, miscellaneous Grapefruit collection, Papaw and Vegetables) B, (top-worked Grapefruit) C. (Cover and Ground Crops) and D. (Long and Short-topped Coffee) comprising a total of 35 acres have come into full establishment, and provide a continuous ource of nterest and instruction to planters, members of the Jamaica Agricultural Society and Agricultural Students.

In addition, a long-range, large-scale experiment involving 16 acres of Grapefruit and 8 acres of Orange has been started, and a first and second treatment with fertilizers undertaken.

A Banana Experiment comprising some 5 acres has been recently laid down.

Crops—

(a) Fodder Crops:

i. Alfalfa—As a result of the success achieved with this crop on a garden scale two extensions under pasture conditions were undertaken, and plots of two squares and three acres are now well on the way to permanent establishment. Inoculated seeds were distributed to eight planters, five of whom report that their plots are growing well.

ii. Egyptian Clover—Three attemps at the establishment of this crop have not met with success and in view of the apparent suitability of Alfalfa trials with Berseem have been discontinued.

iii. Clover (Hubam)—A small trial plot on Section A. has been grown with conspicuous success: further extensions will be undertaken in the coming year. It is encouraging that after many attempts to grow Clover one variety which is obviously suited to the district, has at last been found.

iv. Guatamala Grass—Two small trial plots of this grass have been laid down and from their flourishing condition it seems reasonable to conclude that this new fodder crop will prove a blessing to the cattle industry of this section of the Island.

(b) Tobacco.—A small trial plot of one and a quarter squares of the UX and Machado varieties was grown and gave a return of 185 lbs. of dried leaves from principal and first ratoon, (second ratoon not reaped at the time of this Report)

(c) Covers.—Further work in the attempt to find a suitable cover for Bananas on Red Soils continued throughout the year.

As considerable data was obtained from the use of Overlook over a period of three years, this cover was removed from the plot of Bananas on Section A and an effort made to establish both *Centrosema pubescens* and *Indigofera endecaphylla*. These trials have not met with success. The difficulty of establishing these crops places them outside the reach of ordinary cultivator.

Two squares of Gongo Peas planted thickly, cut back at frequent intervals and kept purely as a soiling crop, show promise of great possibilities.

(d) Citrus.—A heavy crop was set and reaped and delivered to the Low Temperature Station for experimental work. 56 boxes were supplied for the Fair in England. The quality of the fruit was excellent, but due to heavy weather which prevented the execution of a proper spraying programme, the bulk of the fruit showed poor appearance due to markings from melanose and red spiders.

(e) The short-topped coffee on Section A which suffered from die-back as a result of the hurricane of 1935 and subsequent exposure were all cut back and now show splendid recovery. The plot has now set a heavy crop.

(f) Banana—The old manured, ratoon plot of nine-tenths of an acre gave the following returns:—164 nines, 94 eights, 34 sevens for a cash sale of £32 5s. 3d.

A new plot in addition to that mentioned in paragraph 1 of this Report has been planted.

(g) Miscellaneous—The plots of Pine, Papaw and Cane were maintained and gave good returns, and in addition plots of the following were grown and the products exported through the Low Temperature Station: Sweet Peppers, Squash, Tomatoes, Egg Plants, Carrots, Turnips.

(f) Nursery—The Citrus and Coffee nurseries were maintained. 6,693 Bitter Damsel Seedlings in bamboo plots were distributed to 36 persons.

(g) The following projects were undertaken:—

i. Two manurial experiment of Potatoes. The results of the first of these experiments were published in a Paper by the Agricultural Chemist and myself; the data from the second experiment have been compiled and the results will be published in due course.

ii. A survey of the roots of one, two and three year Citrus plants for Fiddler Beetle damage.

The results of this survey will be published in due course.

C. Live Stock.

1. *Cattle.*—It is my pleasing duty to report marked progress with the herd at Grove Place.

The trouble reported last year when a number of heifers died from apparent impaction was brought under control and not a single animal was lost from this cause during the year under review.

At long last the business of breaking in heifers as Dairy animals has been started, 15 such animals having been so broken and kept under dairy conditions at the time of this Report.

A Butter Room has been constructed and equipped and a start made in the making of butter.

Fifteen animals unsuited to our work were sold to the butcher.

Years of work in the grading up of the herd are at last showing results and the herd at Grove Place is now one of which the Department may be justly proud.

All animals were presented to the Valuator and appraised at a total valuation of £1,773 15/-. The average valuation for the past five years is £2,003 3/-.

2. *Mane Stock.*—The imported thoroughbred stallion Snow Boy has been the picture of health and well-being throughout the year. As a result of many victories scored by his progeny on the race track throughout the year he has come into popular favour.

During the re-construction of the stable range he was removed to a near-by property, where but for one case of minor ailment, he was kept in good trim.

The Stallion "Order" was returned to his owner after the season and arrangements made for taking over for the 1937 season the imported stallion "Exaggerated" ("Little Cyn"–"Dark Legend.")

The Proof Ass "Senator Owen" has shown much improvement and gives promise of being a worthy successor to "Kentucky Boy." During the year he suffered from puffy knees, but recovered from bad eyes as reported last year.

The Farm mares have kept in excellent condition and are disproving the fallacy that Grove Place is unsuited to horses. Keeping the manes "hogged," regular attention to the hoof, and continuous use of ear tick-grease and mange-wash have improved their appearance almost beyond recognition.

In addition, owing to a welcome increase in our vote for Feed we are able to make ample provision for grain-feeding our promising stock.

Two such animals were fed, bitted and broken during the year—"Hebe" (Snow Boy–Pianafore) and "Alarnum (Snow Boy–Lemonade). "Hebe" was leased for racing, in October, and has since proved to be the Champion Two-Year Old, winning the Gold Vase and Spring Stakes in convincing style, an achievement of which the Farm is justly proud.

3. *Pigs.*—From the initiation of this project pigs have been issued to the public all over the Island and the Berkshire blood is now widely diffused through the Colony. Excellent pigs have resulted from the half and quarter bred progeny of the Berkshires and it is accepted that the introduction of this breed has been of marked benefit to the pig industry.

The Farm piggery now consists of three splendid boars (two native pure-bred and one imported) and six sows.

The demand for pigs continues to be well in advance of available supply.

4. *Stud Service.*—The possibility of the revival of the Butter Industry in Manchester has given a fillip to the patronage of Dairy Bulls, and although their use is not reflected in the actual numbers many more Dairymen sent cows to the Farm during the year.

An attempt was made to provide service for beef animals by the importation of an Aberdeen Angus Bull but unfortunately he died before he could be acclimatized. The call for this service is insistent.

The ram Tendring Token died during the year, but a native ram Grove Token was available for service.

Animals at the Stud were:

i. Mane Stock	..	Stallion	.. Snow Boy
			Exaggerated
		Jack	.. Senator Owen.
ii. Cattle	..	Bulls	.. Theagenes (Red Poll)
			Etta's Pogis, Glen's Prefect } Jerseys
			Hope Foremost 5th (Guernsey)
			Cortes, Selassie } Mont-Guernsey
			Porpus (Mont.-Jersey)
			Justice (Mont.-Brown Swiss)
iii. Pigs	..	Boars	.. Grove Marquis, Grove Viscount } Berkshires
iv.	..	Sheep	.. Grove Token (Suffolk).

5. The Tables given below show the Live Stock at Grove Place in December with their valuation records of service, sales and deaths during the year.

TABLE I.

LIVESTOCK AND VALUATION.

	Cattle.					Other Stock.				
	Bulls and B. C.	Cows.	Grade Heifers.	C. C. 1936.	Steers	Horse-kind.	Pigs.	Sheep.	Bees (Colonies)	Totals.
No. ..	11	66	45	17	4	36	14	3	..	
Valuation ..	£103 15	£602	£254	£50	£80	£608	£53 10	£7 10	£15	£ 1,773 15

TABLE II.

SERVICES 1936

	Mares to Stallion.	Mares to Jack.	Jennets to Jack.	Cows.	Sheep.	Sows.
Farm ..	6	3	3	99	1	6
Visiting ..	14	10	5	68	..	31
Totals ..	20	13	8	167	1	37

TABLE III.

BIRTHS 1936.

	Foals.			Calves.		Pigs.		Lambs.	
	Colts.	Fillies.	Mule Cubs.	B.C.	C.C.	Boars.	Shotes.	Ram.	Ewe.
No.	2	..	2	16	17	5	5	1	

TABLE IV.

SALES 1936.

	Filly.	Draught Cattle.	Calves.	Total.
No.	1	15	12	28
Price	(leased)	£89 12/-	£5	£94 12 0

TABLE V.

OBITUARY LIST

	Cows.	Bull.	B. C.	Jennets.	Ram.	Pigs.
No. ..	2	1	3 (destroyed)	1 destroyed.	1	5 Crushed at birth

D. AGRICULTURAL EDUCATION.

The system whereby senior Farm School students spend half their final year in Field Husbandry at Grove Place has continued to work to the mutual advantage of the Farm and the students.

In addition to undertaking special individual and group projects, students study the cultural technique of various crops and the care of animals, during the initial stages of their training. Later, they are put in charge of supervision work and so get a fair insight into the employment and management of labour the various rates of pay and valuation of task work.

The observation of Fields Days instituted when the scheme first began has developed into an important part of the course. Ten such visits were paid to pens, estates, packing houses and small settler districts.

Fourteen students were in residence for three periods of nearly five weeks each.

E. DEMONSTRATIONS, LECTURES, FIELD DAYS.

Demonstration and field days were observed when fourteen organised parties spent the day on the Farm.

A large number of persons in small groups and as individuals paid visits to the Farm for observation and advice. There were visitors on 282 days.

Four lectures were delivered during the year, to Branch Societies and one at the Short Course at Hope.

F. IMPROVEMENT AND REPAIRS.

A new range of stables made of faced stone and nearly all native lumber was erected during the year. This range provides a welcome addition to the amenities of the Farm and has greatly added to its general appearance.

Three bull stalls were re-roofed with native cedar shingles.

G. STAFF.

Mr. R. C. Jobson resigned his position as Agricultural Assistant and was succeeded by Mr. H. M. Peterkin.

During the year my services were on call for advice to planters on various matters. Fourteen days were occupied on this work. Two special visits were made for report on two major projects, and in addition I inspected and reported on fifteen properties proposed for Land Settlement.

The loyal co-operation of the staff is recorded.

H. GENERAL.

i. I have to record phenomenal expansion of the work of the Farm in all directions, but especially in the matter of a form of extension work involving attention to numerous visiting planters seeking advice on matters of general and immediate interest.

These visits, with contingent subsequent correspondence, involving as they usually do long hours of extra work on ordinary days, holidays and Sundays, impose a serious drain on the time and physical resources of the staff.

ii. The Farm Water Supply still calls for early attention. Fortunately we have had good rainfall, but with the ever-increasing demand on a system designed for a small stud farm, the safety margin becomes smaller and smaller.

iii. The above remarks apply also to building accommodation. The initiation of a proper building programme is indicated.

ARTHUR THELWELL,
Agricultural Superintendent.

(VII) *Report of Senior Veterinary Officer for Year* 1936.

General Remarks.

1. *Weather.*—

Weather conditions during 1936 were in general good for livestock, at least, in regard to grazing conditions. According to the Weather Report, the mean number of rainy days throughout the Island was 13 days in excess of the 36-year average and the total rainfall for the year in all the 14 parishes exceeded the 10-year average.

May and June were the wettest months of the year with an Island rainfall of 18.35 and 13.77 inches respectively—about twice the average for 60 years—with a mean of 17 and 18 rainy days in each month.

January, February and March were, as usual, the driest months with a fall of 8.79 inches in 21 rainy days in the three months as against a fall of 10.48 inches average for 60-years on 23 rainy days. The mean total rainfall of the Island for the year was 86.20 inches which was 12.33 inches in excess of the 60-year average.

The rainfall in the first half of the year was 57% above the average, but 12% below average in the second half.

2. *Local Livestock Market.*—

The local market for butcher stock in 1936, except for slight improvement in prices towards the close of the year, was much the same as in 1934 and 1935—years of very low prices.

As far as it has been possible to ascertain by general enquiry the average annual output of market milk of recent years was maintained in 1936, but the production of butter has declined due to the pressure of the supply and low prices of the imported article. Unless the struggling butter industry is subsidized, centralized in factories and better organized in regard to production, manufacture and marketing, it will be gradually abandoned.

3. *Trade in Relation to the Livestock Industry.*—

1. Importation of animal husbandry products.

As already indicated, the consumption and price of domestically produced animal products (meat, milk and butter particularly) is affected directly and indirectly in no small measure by the large importations of such products from foreign sources. In many instances the imported article is the more ready seller because of its standardized and dependable quality, convenient pack, and constant availability for domestic use. For these and price reasons large quantities of condensed and other processed milks, canned and barreled meats find a ready sale throughout the Island at local shops, while the local supplies of market milk in most places are subject to shortage in droughty periods, interrupted or spasmodic delivery, rapid spoiling (souring) unless carefully kept, and the suspicion of insanitary production and handling; and local meat, except in the more populous towns, where it is procurable daily, is not available except once or at most twice a week.

According to the Trade Report of the Colony for 1936 the imports of farm animal products were:—

Imports:—

Article.	Quantities.		Values (c.i.f.).	
	1935.	1936.	1935.	1936.
Meat as:—			£	£
Beef—wet salted	1,328,398 lbs.	992,322 lbs.	22,872	16,454
Ham	393,062 "	320,734 "	21,653	17,122
Pork—wet salted	820,264 "	613,504 "	19,236	14,329
Milk, condensed	6,791,045 "	7,994,120 "	104,114	111,797
Butter	1,078,236 "	1,099,629 "	39,037	47,050
Butter substitutes	838,125 "	717,810 "	14,247	13,746
Cheese	593,570 "	527,723 "	17,781	17,004
Lard and its Substitutes	1,030,584 "	1,000,756 "	19,006	19,595
Total Products	12,873,284 "	13,266,598 "	257,946	257,097
Total Meat Products excluding Lard and its Substitutes	2,541,724 lbs.	1,926,560 lbs.	£63,761	£47,905
Total Dairy Products excluding Butter Substitutes	8,462,851 "	9,621,472 "	£160,932	£175,851

2. *Exports and Domestic Consumption.*—

The only available figures of local consumption of meat of domestic origin and exports of animal products (hides, skins) are as follows:—

Article.	Quantity.		Value.	
	1935.	1936.	1935.	1936.
Cattle slaughtered in Island for beef	34,583	34,584	£225,790 (estimated at £6 10s. 0d. a head)	£225,796
Market Milk—estimated at 1/- per gallon on the farm	500,000 galls.	730,000 galls.	£25,000	£36,500
Butter—Locally made and valued on the Farm at 1/- for 1935 and 1/2 for 1936	120,000	110,000 (estimated)	£6,000	£6,415
Hides (exported)	20,405	21,547	£9,458	£11322 (f.o.b.)
Goat skins (exported)	189,427	231,551	£14,398	£20,811 (f.o.b.)

The quantity of locally produced meat consumed is in excess of the above figures, for they do not include the number and value of sheep, goats and swine butchered annually for which there are no available returns, except in so far as the annual export of goat skins (189,427 and 231,551 in 1935 and 1936 respectively) is an index.

A comparative study of these figures indicates the possibilities in store for an improved, enlarged and better organized animal industry in the Colony, especially in its dairy division.

The per capita consumption of fresh cow's milk in the Island is low. Figures obtained for the Corporate Area of Kingston and St. Andrew show a daily supply of about 6,000 quarts (1500 gallons) per diem or 537,500 gallons per annum, which amounts to 1/15 quart (2½ ounces) per diem for each registered school child in the Area.

3. *Exports of Livestock.*—

Horses and Mules	..	1 racehorse from England returned to United Kingdom.
		1 stallion to British Honduras.
		1 stallion to Colombia.
		31 (stallions, mares, racehorses) to Haiti.
		27 horses to Panama.
		2 horses to Porto Rica.
		5 mules to Turks Islands.
Cattle	..	9 to British Honduras: six of which were Aberdeen Angus Bulls.
		1 Holstein-Friesian bull to Colombia.
		1 bull to Cayman Islands.

4. *Imports of Livestock.*—

(i) 28 racehourses from England.
5 racehorses from Haiti.
4 Berkshire gilts from England.
34 dogs from England.
1 cat from England.

(ii) Record of importations of baby chicks by aeroplane from U.S.A. (chiefly Florida).

1932.	1933.	1934.	1935.	1936.
A few experimental lots ..	2,883 chicks	13,570 chicks (91 consignments)	16,016 chicks (98 consignaments)	7,766 chicks (74 consignments)

GENERAL FIELD WORK.

1. Infectious Diseases Notifiable under Law 29, 1922.

All reports and rumours of outbreaks of these diseases during the year were promptly investigated and dealt with according to the Law when a diagnosis was established.

Foot and Mouth Disease.—No outbreak occurred in the year. The last outbreak was in August 1926. A "suspected" condition in working steers at Green Park Estate, Trelawny, (Nov. 18-19, '36) was thoroughly investigated and diagnosed as general sepsis of the feet after a long cross-country drive and subsequent confinement of the steers in an enclosure containing large quantities of fermenting vegetation and dung.

Anthrax.—Suspected outbreaks were investigated at Cranbrook, St. Ann (11.8.36), Kew Park, Westmoreland (2.9.36), Barnett Estate, Montego Bay (3.9.36), Kilbee, St. Catherine (8.12.36), with negative findings for anthrax.

Two officially declared outbreaks were dealt with at:—

1. Grierfield, St. Ann (30.1.36) entailing the vaccination of 520 cattle and all the horses, mules, sheep and goats on the property and quarantine restrictions from 30.1.36 to 10.3.36.

2. Kelly's Pen near Old Harbour Bay, St. Catherine, (16.8.36) with vaccination of 27 cattle, 3 horses, 3 mules and 2 donkeys and quarantine restrictions from 16.8.36 to 6.10.36.

1. *Swine Fever.*—One outbreak at Cockburn, Hagley Park Road, St. Andrew, was diagnosed 17.2.36 among garbage-fed hogs. When reported 27 deaths had previously occurred. Ten days elapsed before serum and virus could be obtained for treating the herd and as result 143 hogs died before the mortality was checked.

The premises were quarantined from 17.2.36 to 1.6.36.

2. An outbreak reported in Southern Manchester by the Jamaica Agricultural Society was investigated 2.7.36 and established to be pneumonia in styed pigs during very wet weather.

2. Other Infectious Diseases.

1. *Texas Fever* (*Piroplasma bigeminum*).—Departmental assistance was rendered in eight outbreaks during the year, namely, at Goshen, Grierfield and Shaw Park in St. Ann, Stone's Hope and a small residential property in Mandeville, Manchester; Kew Park and Woodstock in Westmoreland, and Hartlands, St. Catherine.

2. *Gall Sickness* (*Anaplasmosis*).—For years there has been strong suspicion that this disease existed in Jamaica as a pure infection or concurrently with piroplasmosis.

During 1935 vague reports were received of occasional deaths among cattle suffering from jaundice on pastures adjoining the military cantonment in St. Andrew. On January 19th, 1936, a case of this type of jaundice was reported in a group of imported cows on Retreat Lands which are in close proximity to the above pastures. Blood films showed a heavy infection with anaplasms and clinically the subject showed high fever, great depression and weakness and intense jaundice of the mucous membrances. Three subsequent cases (all confirmed by microscopic demonstration of anaplasms in the red blood cells) occurred in the same group on dates 3.3.36, 15.4.36 and 5.6.36 and a neighbour's milch cow 29.11.36.

The infection was also found at Woodstock, Westmoreland, in sick cattle in July and a bull at Tulloch, Bog Walk, on 30.11.36.

Curative treatment by intra-muscular injections of quinine dihydrochoride (60 grains in 10 c.c. of acidulated water for an adult animal) or sodium cacodylate (8-10 grains per 100 lbs. body weight prepared as a 4% solution) intravenously has been tested. So far best results have been obtained with sodium cacodylate intravenously, but much depends upon prompt treatment early in the course of the fever.

As Piroplasmosis (P. bigeminum) in the form of a latent parasitic blood infection is prevalent through Island, and Anaplasmosis in most countries is usually a concomitant infection (both transmitted by cattle ticks), it is reasonable to surmise that both of these parasitisms in latent form are equally and widely existent in the Island.

Native born cattle, particularly those with Zebu blood in their breeding, are generally immune against the more acute types of fever which these parasites cause in the highly susceptible imported cattle as well as those of European blood origin (breeds), especially when the latter, though native-born, are reared to adult age under tick-free conditions and are subsequently exposed to tick infestation by sale to ticky properties or accidentally become tick-infested at home, or in transferring them from property to property along tick-infested roads or bypaths. Chronic types of tick fever (type undertimined) are very common in some herds, especially where tick-control by dipping is not systematically practised and the cattle have little or no Zebu blood in their breeding.

3. *Tuberculosis.*—This disease has not yet been brought within the powers of The Contagious Diseases Animals' (Inland) Law, 1929, Law 22 of 1922, because certain amendments to the Law are advisable for dealing with it under Island conditions.

Intradermal tuberculin tests were made:—

(i) At Government Stock Farm, Hope, twice during the year, (April 27–May 23rd and again November 3–13th) when no positive reactors were found.

(ii) Of 352 cattle, exclusive of 104 young calves in a privately owned herd. Result 4 reactors, 1.13% of the tested.

(iii) Of 31 dairy cows near Spanish Town, St. Catherine. Result: 2 reactors.

The incidence of bovine tuberculosis in the herds within the Corporate Area of Kingston and St. Andrew is according to the Veterinary Officer of the Area very low. 0.5–1%.

4. *Blackleg* (*Clostridium chauvei*).—Blackleg is, as previously reported, annually recurrent, especially in the moist upland areas of the Island; and dealt with in most cases by vaccination by owners or in the case of small settlers by Instructors of the Jamaica Agricultural Society.

5. *Arsenical poisoning of cattle.*—One such occurrence, first reported as suspected anthrax, was investigated at Ardoch, St. Ann, (8.4.36) and found due to spraying cattle with fluid 16 times in excess of standard arsenical strength for dipping purposes. The cattle so poisoned died within 48 hours after the spraying.

6. *Tick Control* (*Law* 41 *of* 1920).—(i) This project is awaiting the appointment of a Livestock Inspector, one of whose main duties will be to stimulate more general interest and action in tick control. The Government is satisfied that constant official supervision of this important matter is necessary, not only for the well being of the livestock, but also as a safeguard of the amenities of life in country parts and small towns.

On many cattle properties dipping is still maintained with fair regularity because progressive owners are satified of its value in regard to the health of their stock and its economic advantages as seen in more rapid growth and better fattening of their cattle.

(ii) Registered Dipping Tanks in

1932	1933	1934	1935	1936
362	368	372	376	379

Several are in such bad order that they are inoperative.

7. *Canine Distemper.*—Outbreaks in various localities are sometimes reported to the Department, but as the disease is not a real livestock matter and is not notifiable officially, no special action is taken.

An outbreak of intense severity and wide extent around Montego Bay with similar reports from Savanna-la-Mar was investigated in July to satisfy the Government that the infection was canine distemper and not rabies.

To popularize immunization against distemper, especially with owners of well-bred dogs, some twelve dogs were treated at the request of their owners by the Laidlaw-Dunkin method of vaccination. The results have so far been entirely satisfactory and further action in this respect is now entrusted to private practitioners.

8. *Other infectious and parasitic diseases.* The references made in Annual Report of 1935 to bovine infectious abortion, hæmaturia vesicalis of cattle, internal and external parasitisms, scabies and poultry diseases are applicable to 1936. No special work or surveys of these diseases were undertaken during the year, except by correspondence with enquirers.

3. *Veterinary Services in Government Institutions.*

1. *Government Farm School at Hope.*—Lectures and demonstrations (3 periods of 2 hours weekly) in veterinary science were given in accordance with the School curriculum during the three school terms of the year.

2. *Government Stock Farm at Hope. –Horses and Mules of Hope Gardens and Farm.* –Their general health throughout the year was good, except for occasional cases of colic and lameness from "gathered nails," kicks, strained tendons, etc.

Cattle

1. *Tuberculosis.*—As reported for 1935, the intradermal tuberculin test of November 18-23, 1935 of the Hope Farm herd showed 21 positive reactors among the 457 Farm cattle (4.8%)

The 21 reactors consisted of 5 cows, 3 bullkins and 13 heifers -the last all from the same group, known the heifer house lot.

Shortly after the test the 5 cows and 3 bulkins were slaughtered at a local abattoir and all showed lesions. The 13 heifers were isolated from the herd immediately after the test and re-tested intradermally April 27–May 1st, 1936, when nine of them again reacted positively. Subsequently all thirteen were autopsied (11 at abattoir and 2 on the Farm) when gross lesions were found in all except one case.

In view of the high percentage of reactors to the November test of 1935, increased sanitary precautions against recurrent infection in the herd was instituted and the entire herd was tested intradermally twice during 1936, namely, April 27th–May 22nd and November 3rd–13th, with the encouraging result of no reactors being found.

Record of Intradermal Tuberculin Test of 1936.

1. (a) April 27–May 2nd by Senior Veterinary Officer. Tested: 272 cattle, namely:
   (i) 5 privately owned animals on the Farm.
   (ii) 267 Farm-owned animals: as follows—26 bulls –5 imported (Red Poll, Theagenes, Holstein, Posch, Guernseys, Foremost's Monogram and Double Folly; Jersey, Fon 70A), 8 native-bred bulls and 13 bulkins of various ages.
   (iii) 23 dry cows and foster mothers.
   (iv) 130 heifers—bred and unbred.
   (v) 71 heifer calves—most of them still on milk.
   (vi) 3 bull calves.
   (vii) 14 working steers.

(b) May 19–23, 36 by Dr. G. O. Rushie Grey, Veterinary Officer of Kingston and St. Andrew Corporation assisted by Senior Veterinary Officer. Tested: 178 cows—141 in milk and 37 near calving.

Total: 445 Farm-owned and 5 of private ownership –450 head. Result of test: no reactors.

2. November 3–13, 1936 by Senior Veterinary Officer. Tested: 473 cattle, namely:
   (i) 7 of private ownership.
   (ii) 466 Farm-owned animals as follows:—24 bulls—5 imported (Red Poll, Theagenes; Holstein, Posch; Guernseys, Foremost's Monogram and Double Folly; Jersey, Fon70A). 14 native-bred stud and young bulls; 5 bulkins of weaning age. 213 cows—148 being milked, and 65 dry or fostering calves. 146 heifers—bred and unbred. 4 bull calves on milk. 65 heifer calves—most of them on milk 14 working steers.

Total: 473 head—466 Farm-owned and 7 of private ownership. Result of test: no reactors.

Record of Tuberculosis of Farm for 10 years 1927-1936.

Month of Test.	Number Tested.	Result.	Percentage Infection.
January 1927	359 head	20 reactors	5.56%
July 1927	303 "	1 reactor	0.33..
December 1927	312 "	1 reactor	0.32%
November 1928	297 "	1 reactor	0.33%
October 1929	342 "	1 reactor	0.29%
August and October 1930	326 "	No reactors	Nil
December 1931	348 "	1 reactor	1.28%
June 1932	227 "	No reactors	0%
June 1933	293 "	No reactors	0%
June 1934	407 "	14 reactors	3.4%
November 1934	401 "	7 reactors	1.74%
November 1935	457 "	21 reactors	4.81%
April-May 1936	445 "	No reactors	Nil
November 3-13, 1936	466 "	No reactors	Nil

2. *Infectious Bovine Abortion* (*Bang's Disease*).—

(a) This disease, affecting as it does the breeding efficiency of the herd in complex ways, is quite a problem on the Farm, where infection was apparently introduced early in its history (1910-11), by the importations of infected females from abroad for initial stocking of the Farm, and again in similar manner in 1920. (Vide 1934 Annual Report and Histroy of Hope Farm by H. H. Cousins).

Although the incidence of actual recorded abortions in the herd during successive years has not been inordinately high at any time, the infection (acute and latent) has persistently affected adversely the general productivity of the breeding herd by abortion, decreased lactation in affected subjects, reduced breeding efficiency (sterility and delayed conception) and the frequency of port-parturient troubles.

In 1914-15 a partial trial was made to deal with the problem by segregation based on agglutination tests, but the attempt was not long continued, as segregation was impracticable under then existing farm conditions and there was a disappointing lack of agreement between the parturient record of the tested cows and the result of the agglutination test as interpreted in those days.

During August and September, 1936, a survey by means of the Rapid Method Agglutination Test was performed on 154 cows, 28 heifers of various ages, and 29 heifer calves. On the basis of complete agglutinationin in a dilution of 1-50 or more the test showed "positives" in 56 of the 154 cows (36.3%), 2 of the 28 heifers (7.1%), and nil of the 29 calves reared on powdered skim milk.

In view of the long-established existence of the infection on the Farm and the general conditions of its operation and location, it is very doubtful if segregation based on systematic agglutination tests can be instituted and effectively maintained.

(*b*) *Parturition and Abortion Record* 1928-36.

Year.	Full Times Births.	Still Births.	Abortions.	Deaths from dystokia.
1928 ..	94	2	5	
1929 ..	81	2	8	
1930 ..	118	4	4	
1931 ..	126	..	9	
1932 ..	127	1	9	
1933 ..	144	4	7	
1934 ..	148	6	nil	
1935 ..	158	3	4	2
1936 ..	155	9 (5 premature twin births)	6	4 (as phyxiated in delivery)

(c) The incidence of sterility in the herd is still a serious problem, especially as several of the cows become permanently sterile or conceive only after long periods subsequent to parturition or abortion. Ovarian treatment (expressing of retained corpora lutea, rupture of cysts and massage) has been employed in several cases, but has not been uniformly successful. It is proposed to try the effect of harmones and vitamin E injections of various kinds, such as wheatgerm oil, in association with manual treatment of the ovaries and douching of the genital canal.

During the year 31 of the Farm cattle were drafted for butchering for the following reasons:—

1. Sterility: 11 cows, 6 3-4 yr. heifers = 17 heads.
2. Aged and past further service: 2 steers, 6 cows = 8 head.
3. Bad udders and no milk 3 cows.
4. Abnormalities: 1 bulkin, "Standard" —undeveloped sexual organs.
   1 heifer calf "Norissa 2nd"—mule-hoofed.

Total: 31 head: 17 for sterility: 14 other causes.

3. *Tick Fever (Piroplasmosis bigeminum).*—

Regular dipping of the Farm herd and the cattle of adjacent holdings was so successfully maintained throughout the year for tick suppression and limitation of tick-borne infection of the cattle, that no case of naturally transmitted tick fever occurred during the year.

4. *Blackleg (Clostridium chauvei).*—

There were no cases during the year; but, as in the past, preventive vaccination with aggressin was carried out—167 cattle of susceptible age were vacinated in February (20.2.36).

5. *Actinomycosis.*—

One case (Grade Holstein cow, Mush): infection of the upper left maxilla which proved incurable and the emaciated subject was killed.

6. *Obstetrical cases.*—

(i) Dystokia: 9 cases—4 in connection with single births, 5 with twin births.

(ii) Retention of foetal membranes: 7 cases: 3 associated with still births; 2 with abortions and 2 with full-time births.

(iii) Prolapsus vaginal: one case, Tilda 9th.

7. *Pneumonia.* 7 cases.

1. Red Poll bull, Boast, from a chill contracted during transportation to the Farm from Westmoreland.
2. Norbrook 4th (Grade Jersey cow) of high milk yield during a very wet spell in June.

3–7 pail-reared cow calves.

8. *Pneumo-enteritis* continues to be the chief ailment among the pail-reared calves, expecially in their earliest days. It is a trouble of intermittent occurrence, especially during rainy weather, although the young calves are regularly housed in bad weather. The mortality from this cause, inclusive of the five calves listed under pneumonia proper, was seven of the 155 born during the year.

9. *Sepsis* from navel infection was much higher in the latter part of the year than usual. Six calves died or were killed for this reason.

10. *Interdigital Sores (Fouls).* 10 cases.

Most of these appear during the wet season and apparently originate from maceration of the interdigital tissues and the entrance of infective soil organisms. In some (the more severe cases) there is a deep necrotic slough indicative of bacillus necrophorus infection. Unless the cases are promptly treated there is grave risk of infection penetrating deeply and causing the loss of one or both major claws.

Deaths of Live Stock at Hope.—

Horses and Mules—Nil.

Farm Cattle.—

Tuberculosis: killed as reactors to tuberculin or physical non-reacting "suspects." 3 cases.

1 Grade Holstein heifer, Donorma 3rd—positive reactor to Nov. 1935 test: tuberculous lesions found at autopsy.

2. Grade Guernsey heifer, Veracity 2nd—positive reactor to Nov. 1935 test: tuberculous lesions found at autopsy.

3. Grade Jersey cow, Lydite 5th—non-reactor to test but physically a "suspect": no lesions at autopsy.

Accidental injuries—2 cases: 1. Red Poll, Berta, 2. Grade Jersey, Conora.

Actinomycosis: Grade Holstein Cow, Mush, killed because of incurable condition of left upper jaw.

Septic metritis: Grade Holstein cow, Blush, 23 days after premature birth of twins.

Pneumonia:—7 cases.

1. Red Poll bull, Hope Boast: a sequel to transportation to Farm from Westmoreland,

2. Grade Jersey cow, Norbrook 4th.

3-7 Cow calves, Minnie 2nd, Macka 1st, Fantom 4th, Emily 2nd and Crust.

Pneumo-Enteritis: 2 cases.

Cow calves, Alicia's, Kola shortly after birth.

Sepsis from navel infection: 6 cases.

2 bull calves and 4 cow calves.

Still births:—13 cases.

(i) 4 from asphyxiation resulting from mal-presentation and difficult parturition.

(ii) 9 in connection with birth of twins to 5 cows, Beano, Tosch, Blush, Monica 15th and Saysa—the first three prematurely, the last two at full term.

Acute indigestion—2 cases.

Cow calves, Fragrance 4th and Ruth 4th.

Acute hepatitis with jaundice: 1 case.

Cow calf, Doris 3rd.

Senility—2 cases.

Killed as emaciated and senile. 1. Purebred Jersey, Sayda.

2. Grade Guernsey, May 3rd.

Weakling birth—2 cases.

Killed: bull calves of Quack 1st and Donorma.

Summary.—

1. Killed for assigned reasons:—4 cows, 2 heifers, 2 bull calves = 8 head

2. Died from disease: 1 bull, 4 cows, 2 bull calves, 14 cow calves = 21 head. Total 29.

3. Still births:—

(i) Asphysiation during dystokia	4	
(ii) In connection with birth of twins to 5 cows	9	13

Poultry.—Flock infections during the year as in the past were:—

(i) Fowl cholera (B. visepticus) which is periodically recurrent and manifests itself most frequently as peritonitis arising from ruptured ovisacs.

Vaccination twice yearly with Hemorrhagis Septicaemia Aggressin has been found fairly effective in checking outbreaks and lessening the incidence of the type of peritonitis mentioned.

All the adult and semi-adult birds of the flock (74 birds) were so treated February 2, 1936, after the disease again appeared in the flock and was microscopically established.

(ii) Contagious Epithelioma known locally as "Yaws."

A mild type infection affected a few of the young birds during the year without serious results.

Deaths and Causes.—

Peritonitis from ruptured ovisacs: 2 hens.
Sepsis from wounds: 1 cockerel, 1 hen.
Egg-bound: 1 hen.
Infection of tarsol joint (bumble foot) 1 cock.
Intussusception (small intestine) 1 cockerel.
Chronic diarrhoea: 1 old hen.
Impaction of crop. 1 hen.
Undetermined: 1 hen.
Total: 10 birds—3 cocks, 7 hens.

Stud Farm at Grove Place, Manchester.—

1. The rainfall at Grove Place during the first six months of the year was well distributed and far in excess of the average for that locality, where very little rain usually falls in the first three months.

In the latter six months it was somewhat below normal, yet sufficiently abundant for the pastures and crops.

Ten official visits were made in the year; 3 in first, 3 in second, 3 in 3rd and 1 in 4th quarter.

2. *Health and Disease Record for* 1936.—(i) *Psoroptic mange*: Psoroptic mange of the horsekind was kept well under control by systematic use of lime-sulphur wash, and would have every prospect of being eradicated if reinfection was not periodically introduced by mares sent to the stud.

(ii) *Anthrax*: In view of the outbreak of anthrax among the cattle in September, 1935, prophylactic vaccination was given to the cattle and horsekind twice during the year—February 24th and August 21st—and the year passed without any recurrence of the disease.

(iii) *Tuberculosis*: No tuberculin test was applied in the year. Tests at Grove Place have usually been once every two years in view of its past record as given in Annual Report of 1935 when the last test was conducted.

Date.	Farm.	Cows to Stud.	Result.
November, 1924 ..	214	..	All negative
April, 1925 ..	420	..	" "
July, 1930 ..	162	..	" "
July, 1933 ..	150	..	" "
August, 1935 ...	141	5 " 146	" "

(iv) *Blackleg*: Annual and sometimes semi-annual vaccination against this disease is the rule at Grove Place because of intermittent deaths in the past on certain sections of the Farm.

The cattle of susceptible age and the sheep were vaccinated in the Spring. No losses from this infection occurred during the year, except the imported Suffolk ram.

(v) *Swine Fever* (hog cholera): Precautionary virus-serum treatment for this disease was given, 4.4.36 to the farm-owned hogs as a safeguard against the possible introduction of infection by sows sent to the Farm for mating.

3. *Memo. of Deaths of Livestock*, 1936.—*Horsekind*: She ass, "Dapple," destroyed on account of old age 15.9.36.

Cattle: 1. "Eloquent Bandolier," Aberdeen Angus Bull, imported from U.S.A. Dec. 19th, 1935. Kept at Hope Farm December 19th, 1935–April 29, 1936, when he was sent to Grove Place and died May 8th from impaction of the 3rd stomach during an attack of Anaplosmosis.

2. Cow, Veronica, from gastro-intestinal impaction.

3. Cow, Dressy, from choke by an orange.

4. and 5. Bull calves—2 killed because of no sale for them and their dams needed for dairy purposes.

Small Stock.—Sheep: imported Suffolk ram, Tendring Token, on 10.2.36 from Blackleg

Swine: 2 sows (one imported, one native born) from undetermined cause. 3 young pigs from being crushed.

Public Works Department.—1 Veterinary inspection of horses and mules offered for sale to the P.W.D. Mule Purchasing Committee on their tour, Sept. 21-25, 1936, to P.W.D. Station at Clifton, Spanish Town Road, Spanish Town, Water Mount (St. Catherine), Lucky Hill (St. Mary), Claremont, St. Ann's Bay, Orange Valley, Minard and Brown's Town (St. Ann), New Forrest (Trelawny), Adelphi and Montego Bay (St. James), Kew Park and Morelands (Westmoreland); Black River, Hermitage, Mountainside, Success, Santa Cruz, Goshen, (St. Elizabeth); Spur Tree and Mandeville (Manchester); and Halse Hall (Clarendon).

2. Veterinary Report on 4 horses, 21 mules of P.W.D. Station in Westmoreland as inspected at Sav.-la-Mar 17.7.36.

3. Visits as follows for reporting on or treatment of mules at P.W.D. Stations at Halfway Tree, 20; Gordon Town, 2; Lawrence Tavern, 1; Clifton (Spanish Town), 3; Stony Hill, 2; May Pen (Clarendon), 1—Total: 38 visits.

Department of Prisons.—2 visits. Veterinary report on old rheumatic pony and treatment of mule, Rhoda.

Island Medical Office.—Mule, Melba, twice treated for colic.

Lunatic Asylum.—Castration and docking of the spring lambs of 1936 with Farm School students. 46 ram lambs, 35 ewe lambs.

Educational Work.

1. Lectures and Demonstrations in Veterinary Science at Farm School, Hope; 3 periods of 2 hours weekly during school terms.

2. (a) Organized and participated in a Short Course in Beekeeping for Plant Disease Inspectors and Agricultural Instructors of Jamaica Agricultural Society held January 10-11, 1936, in connection with Annual Staff Conference of the Department (Jan. 6–7, 1936).

Subjects—

(i) Bees in the Insect World and their Role in the Pollination of Flowers by W. H. Edwards, Government Entomologist.

(ii) Honey bees: hives, brood rearing, swarming and general apiary management, by H. H. Coote, Instruction in Beekeeping, Jamaica Agricultural Society.

(iii) The Commoner Enemies of Bees in Jamaica by Hy. S. Holt, Inspector of Apiaries.

(iv) Diseases of Bees with Special Reference to Foul Brood and its Control by S. Lockett, Senior Veterinary Officer.

(v) Demonstrations by H. H. Coote and Hy. S. Holt of apiary practices.

(b) Demonstration by Autopsy that Emaciation in Cattle is not necessarily of Tuberculous Origin. Subject: an emaciated non-reactor to tuberculin test (Lydite 5th of Farm).

3. (i) Paper on "The Advantages of Early Maturity in Livestock Breeding" in Summer Course of Lectures in Agriculture (July 20-25, 1936).

(ii) Demonstration of Determination of Pregnancy in Cattle.

4. Letters and interviews with stockmen on veterinary and livestock matters.

Publications—None in 1936.

Statistical Information.

1. Cattle, exclusive of sheep, goats and swine, slaughter for beef: 1935, 34,583; 1936, 34,534.

2. Exports of Livestock:

Animal.	Number.	Class.	Destination.
Horses . .	1	Racehorse	England (returned)
	1	Stallion	British Honduras
	1	Stallion	Colombia
	31	Stallion, mares racehorses	Haiti
	27	..	Panama
	2	..	Porto Rico
Mules ..	5	..	Turks Island
Cattle ..	9	Bulls (6 Aberdeen Angus)	British Honduras
	1	Holstein	Colombia
	1		Cayman Islands.

3. Imports of Livestock:

Animal.	Number	Class.	Origin
Horses ..	28	Racehorses	England
	5	"	Haiti
Cattle	nil		
Swine ..	4	Berkshire gilts	England
Dogs ..	34	Various breeds	"
Cats ..	1	..	"

4. Importations of Baby Chicks. By aeroplane from Miami, Florida, U.S.A.

1932.	1933	1934	1935	1936.
A few experimental lots	2,883	13,570 (91 lots)	16,016 (98 lots)	7,766 (74 lots)

5. Dipping Tanks on Register of Department:

1928.	1929.	1930.	1931.	1932.
305	329	341	351	362
1933	1934	1935	1936	
368	372	376	379	

6. Sales of Paranaph and Arsenite of Soda from Government Laboratory mainly to owners of registered dipping tanks:

Lbs.	1928.	1929.	1930.	1931.
Paranaph ..	37,353	37,840	33,572	36,770
Arsenite of Soda	21,900	21,725	20,175	25,499
	1932	1933	1934	1935
Paranaph ..	34,965	39,850	33,373	36,654
Arsenite of Soda	22,021	24,818	20,300	21,200
			1936	
Paranaph			35,942	
Arsenite of Soda			19,736	

7. Registered Apiarists and Apiaries.

Area.	Year.	Apiarists.	Apiarise.	Estimated Colonies.
Kingston & St. Andrew	1935	97	126	3,279
Kingston & St. Andrew	1936	93	109	3,370
Other parishes ..	1935	157	292	12,444
	1936	164	300	12,645
Estimate for Island ..	1935	425	558	
	1936	450	609	

S. Lockett, V.M.D.
Senior Veterinary Officer.
April 12th, 1937.

Report of Foul Brood (American) January-December 1936.

1. Governmental supervision and control of this third occurrence of American Foul Brood of Bees (Bacillus larvae), which apparently began September to November 1934, officially dated November 13, 1934, (when definitely diagnosed as a separate entity from a seasonal occurrence of sac brood), has been continued during the two years ending 31.12.36.

2. The results attending these control measures in 1935 and 1936 have been very encouraging as the following observations show:—

(a) The infection, as far as it has been possible to ascertain by actual inspection of apiaries and reports made by apiarists, has remained confined to limited areas in Kingston and the lowlands of At. Andrew, and has not been found or reported in any other part of the Island.

(b) Only 15 of the 126 apiaries on the Register in 1935, consisting of 3,279 colonies (estimated in part) have fallen to infection between November 13, 1934 and December 31, 1936, i.e. approximately 12% of the apiaries.

(c) The suppression of the disease effected up to 31.12.36 has been accomplished by the loss of only 61 colonies in the case of apiarists complying with Regulations and 89 colonies in the case of a single apiarist who refused to conform with the Regulations and whose entire apiary was destroyed by an Order under Law 9 of 1918, on March 3, 1936.

The total of colonies destroyed (incineration of hives and contained colony) between November 13, 1934 and December 31, 1936, was 150 i.e., approximately 4½% of the colonies in Kingston and St. Andrew.

(d) In 8 of the 15 infected apiaries where initial infection was discovered early and the affected hives and colonies promptly incinerated, there has been no recurrent infection since, that is for periods varying from 9-24 months. In the other 6 apiaries, exclusive of the one which was completely destroyed as above, initial infection was not discovered early. In these cases recurrent infection persisted for periods of 2–7 months, but was finally checked.

3. Number of infected apiaries November 13, 1934–December 31, 1936 15; approximately 12% of the apiaries in Kingston and St. Andrew.

4. Status of Registration of Apiaries as of date 31.12.36:

1936.	Apiarists.	Apiaries.	Colonies.
Kingston & St. Andrew ..	93	109	3,370 (?)
Other parishes	164 (?)	300	12,645 (?)
Total ..	257 (?)	409	16,015 (?)

Note.—The number of apiarists is constantly changing. Some cease operations and sell out, others start.

Similarly the number of apiaries is subject to frequent change by sales and combination of apiaries, as well as expansion of the industry or extinction by natural causes and neglect. The number of colonies, except in Kingston and St. Andrew, where a count of each apiary is made when inspected, is very variable. This is due to increases by natural or artificial multiplication of the colonies, combining weak colonies and losses from natural causes.

The registration, especially for the parishes other than Kingston and St. Andrew is very incomplete. Accordingly it is estimated that there are about twice as many apiarists and two -thirds more apiaries in the area outside of Kingston and St. Andrew.

5. The work of apiary inspection in 1936 was carried out by Mr. Hy. S. Holt assisted at times by a competent young apiarist, N. W. Crawford.

S. Lockett,
Senior Veterinary Officer,
Officer i/c for Director of Agriculture.
12th April, 1937

VIII.—*Report of Supervising Inspector of Plant Diseases.*

Director of Agriculture:

I beg to submit my report for the year ended 31st December, 1936.

Panama Disease.—.—The "one-root" system for treating Panama Disease was adopted throughout the Island, except in the parish of Hanover. The planters co-operated earnestly with the Inspectors in carrying out the treatment. In the Fall and early Spring, owing to flooding, the disease took an epidemic form in the parishes of St. Mary and St. Catherine, but with vigilance of planters and Inspectors the diseased plants were destroyed. Reports on the mis-use of the Gas Oil were investigated and every attention given to see that the oil taken by settlers was used on the diseased roots.

Citrus.—Distribution of budded citrus plants was continued during the year. Owing to the fact that the planters appreciated the Loan Scheme only about five thousand of the 80,000 plants had overgrown in the nursery.

Mangoes.—The mango budding campaign was started on the Liguanea Plains in August, just after the reaping of the previous crop. Two apprentices were employed for this work. When a survey was made it was found that quite a large amount of young trees were ready for budding without top working. Immediate action was taken whilst advising the proper method of top working to bud these young plants. There are now growing 3,152 buds upon 1,480 trees and there are 2,200 large trees cut back for top working. Visits are continually made to these trees and as soon as the shoots give an inch in diameter they will be budded.

Bananas.—One breeding plot was established with Giant Plantain and Highgate bananas at Tom's River, one mile from Castleton. Pollination and work generally on banana breeding is now being conducted by the Botanist, details of which will be reported on by him.

Land Settlement.—Several visits were made to Land Settlement properties and one demonstration plot was started in Portland.

(Sgd.) J. B. Sutherland,
Supervising Inspector of Plant Diseases.
31.3.37.

IX.—*Report of the Agricultural Officer.*

I now submit my report for the year ending 31st December, 1936. The duties devolving upon me have continued to be linked primarily with the propaganda in the extension of citrus planting throughout the Island.

A. Field Work.

1. While the propaganda for citrus extension from the Government Nurseries at Spanish Town was launched first in St. Mary with a view to a substitute crop being introduced for the replacement of bananas in diseased areas, it has now extended rapidly in Clarendon, St. Catherine, Manchester and St. Ann, largely in all the parishes east and inclusive of Manchester and St. Ann—in other words, the counties of Surrey and Middlesex.

2. Ample opportunity has now been available of observing the effects of the follow up work of the Department in the fields now entered upon their third year, and others not far behind. In the heavy soils of St. Mary, there is nothing to support the scathing condemnation, launched from influential quarters, of this venture, neither from a growth point of view, nor, judging from present indications, the crop results.

3. Unfortunately, the large land owner and banana grower still adopts a nonchalant attitude and is not lending the hearty co-peration which the movement of the Government appears to demand. Yet there is even in this the one or two exceptions which shine out in bold relief, and are a very great asset to the progress of the work in this parish. One of these has the undoubted pleasure of growing about 600 of the best developed and healthiest plants in 10 months that I have seen anywhere, even admitting that the field lacks complete uniformity.

4. Clarendon, which holds first place in the plant distribution, has maintained a well balanced advance in its work due to some extent without doubt to the steady work of the Agricultural Instructor and the Inspector of Plant Diseases, both of them graduates of the Farm School. Watch has been kept upon older fields, but the results have been delayed in this parish owing to neglect in keeping a 5 ft. circle surrounding the plants completely free of weeds, many of which over-run the citrus and check its growth. Slug attack has also subscribed its quota of trouble. Advantage has been taken of the Citrus Development Loan Scheme in the Mocho area where there are over 40 acres already established and a similar quantity in course of preparation. Small fields dotted throughout the parish display varying degrees of success.

5. Whatever may be said of the advances made in other parishes St. Ann holds an enviable record. At Spring Mount near to Salisbury P.O. in St. Ann, 350 plants were set in December 1935, and up to about September 1936 every plant was in good growth, when two were completely killed by the grub of the Fiddler Bug. Two more have since collapsed from the same cause. The nearest approach to this was at Liberty Hill near Lime Hall P.O. where the loss was two plants in the first 3 months and no more until 6 months later two more succumbed, in my opinion, from the overgrowth of running weeds on a hillside.

6. In the Blue Mountains we have now two 10-acre lots, one being about 3,500 and the other under 3,000. Regular visits have been paid to both resulting in discoveries of some of the elements active in delaying the development of plants in the steep slopes. Although circle weeding of a radius of 5 feet surrounding the plants is usually enough for the level lands, on these steep hillsides it was revealed that the over-growth above exercised an influence, through shade, detrimental to these plants which, at the most, enjoy little of the value of the direct rays of the sun, with the inevitable issues, viz., continuous recurrence of scale attack, and poor conditions leading eventually to collapse. For such steep slopes on the upper side the clearing must be at least 6 feet taken at right angles to the plant from the top.

7. It cannot be said, however, that plant development here is much behind that in other places. The soils do lack humus and legume green manuring is essential. In one section where Overlook Beans were interplanted and buried in at the end of the year the healthy green of these plants is distinctive amongst the other sections and is a true index to the requirements. Other legumes are being tried, but the work proceeds very slowly.

8. Spraying formerly done exclusively by an officer of the Department or of the Jamaica Agricultural Society, is now to some extent being carried out by the owners of 100 plants or more. The needs of small lots are still cared for by the officers mentioned. In many instances scale insects have been very well controlled, while in others spraying had to be continued right into the Fall (owing to neglect in the earlier months).

9. The grub of the Fiddler Bug has reaped a harvest of our plants by girdling above the crown, where the crowns have been covered with earth.

B. Interplanting.

10. The inter-cropping of economic quick crops has been continued and extended with conspicuous success. The reasons were set out in the former report under headings as follows:

1. Yielding cash returns.
2. Maintaining the fertility.
3. Green manuring with legumes.
4. Windbreaks.

I am now convinced that after the first 6 months in heavy soils in particular the proper tilth of the land between the citrus plants is necessary for good growth. In situations exposed to steady winds even if not very strong, an upstanding crop is requisite. In one case cane proved to be extremely beneficial and yielded a good profit. In another the crop was yams with an almost spectacular result. All these cases, however, must be guarded lest the useful result be unduly hazarded by the interplants, especially after a truly successful effort in the first year.

11. Owing to the fear of Fiddler Bug we have endeavoured to eschew Sweet potato cultivation, but it is practically impossible to get lands properly forked when too many restrictions are introduced and it has had to be permitted with great reluctance in some districts.

12. Irish potatoes under my direction have proved quite successful under the first two headings above. My recommendations to follow with a red peas crop have also fructified. It is encouraging to note that citrus plots have shipped new potatoes, string beans, egg-plant and peppers through the Low Temperature Station, and the success achieved has created an incentive for extension. The change in the citrus plants alone is worth the effort, and one welcomes the assistance of the officers of the Low Temperature Station at these plots in the interplanting development.

13. A co-operative effort between large planter and small cultivator has been fostered with a measure of success. The land is given without charge for the growth of catch crops under regulations framed according to the requirements of the citrus plants. The interspace receives the cultivation and, where the crops are suitably adjusted, only good accrues.

C. Demonstration Plots.

14. These are still maintained, though as before recorded the hearty co-operation of other planters gives the demonstration idea to many other plots.

Manurial tests are also being continued, with the assistance of the Agricultural Chemist.

D. Citrus Development Scheme.

15. This scheme has added considerably to the demand for plants, there being already planted 211. acres owned by 25 persons. The keen interest displayed by all of them, without exception, considerably enhances the pleasure of the officers of the Department in their work.

E. Nursery.

16. It is regrettable that orders have had to be delayed owing to a shortage of plants. Assistance was given in suggestions for the preparation of the land as also in the actual planting of seedlings.

F. Distribution of Plants.

17. The distribution of plants, seriously curtailed by the shortage, continued in smaller measure, the total aggregating 17,632.

18. Our principle of setting the plants ourselves has been scrupulously pursued with few exceptions. Our digging and packing methods, while still open to improvements have, it would appear, often been sorely tried and have withstood the tests with remarkable constancy.

G. Meetings.

19. The Departmental Conference on the 6th and 7th January was attended, but an attack of Malarial fever compelled my absence from the first part of the Summer Course.

The Agricultural Show at Highgate provided a stall for the Department, and a citrus display was taken there on the previous day by the Supervising Inspector of Plant Diseases and myself in our cars. The next day we both attended at the Show, where much interest was taken by the public in our affairs. Grapefruit grown at Cartref near Port Maria was shown in support of the fact that fruit is obtainable practically throughout the year.

H. Miscellaneous.

20. The field staff of the Jamaica Agricultural Society and the Plant Disease Inspectors have continued to serve in the planting and in the maintenance of plants, much of the actual spraying being done by them.

The staff of the Prisons Department has also maintained its help in the nursery work in which the Juveniles are receiving a fair degree of training. Their cooperation is much appreciated.

21. Apart from my substantive duties I assisted the Tobacco Specialist in his visits to the Tobacco areas in St. Andrew.

22. For 3 months from 28th September I assisted in the Head Office during the absence of the Chief Clerk on leave. During that period my own work was maintained up to a fair standard by occasional visits, sometimes in the early morning starting at 5 a.m., and at other times by taking occasional absences of a day or part of a day from the office.

23. I was also called upon to inspect properties under the Land Settlement Scheme.

L. L. Carrington,
Agricultural Officer.

Distribution of Varieties.

Grapefruit:	
Marsh Seedless	8,132
Davis Seedless	671
Thompson Pink	1,022
McCarty	18
Orange:	
Valencia, Isleworth	4,643
Valencia, Reasoner	1,183
Lue Gim Gong	673
Surprise Navel	699
Parson Brown, Waite	171
Lambs Summer	61
Hamlin	138
Temple	37
Tangelo, Thornton	69
Tangelo, Seminole	25
Tangelo, Lake	52
Lakeland Limequat	18
Villa Franca Lemon	6
Perrine	11
Oranguma	1
Rusk Citrange	1
Oneca	1
	17,632

Distribution in Parishes.

St. Mary	3,576
Manchester	1,477
St. Catherine	3,608
Clarendon	4,553
Portland	320
St. Andrew	616
St. Ann	1,233
St. James	891
St. Thomas	521
Trelawny	200
St. Elizabeth	169
Westmoreland	254
Hanover	214
	17,632

Of this total 729 are supplies for dead or unthrifty plants.

Report of Tobacco Specialist (July to December, 1936).

As a result of the new Tobacco Scheme under the Agricultural Development Board programme, I was appointed Tobacco Specialist and arrived from England early in July. The tobacco-growing districts were visited to ascertain how many planters were likely to join in the new scheme; many interested banana planters were interviewed as they were keen to know if their Panama-diseased lands could grow the required type of tobacco, i.e., cigar leaf varieties; letters from all classes were received asking for information. Many small growers wished to come into the scheme and sign contracts, which meant that they would be able to borrow money with which they could start tobacco planting. However, it was considered advisable to start with those planters who knew something about tobacco planting even though their methods were antiquated. It was decided also to start experimental plots where the new methods would be used and where seed trees would be kept for producing new kinds of seed to be distributed to the planters the following year. Many of the existing tobacco growers were contractors to the firm, Messrs. B. & J. B. Machado Tobacco Company, and many were contractors to smaller manufacturing firms or exporters. It was not desirable to interfere with these planters in any way so great care had to be taken that none of them were registered under the new scheme.

2. *Experimental Plots.*—During July, three plots were selected for experiments. The first plot was at Hope where the experiments could be constantly under supervision; the second was selected at Cherry Garden where many East Indian planters were already established; and the third was at Temple Hall in the Wag Water Valley where tobacco had been successfully grown many years ago, but had since been given up. Each plot was 2 acres in extent and on each plot a tobacco barn of rough wood and thatched roof was built. Small plots were also chosen in St. Elizabeth, Manchester and Portland. During the latter part of July and in August, the plots were prepared. The soil was twice ploughed and twice harrowed; the necessary drains were dug; and the land selected for seed-beds was further forked and cleaned. The setting out of cross-drains and paths was to a systematic plan. The cross-drains ran from east to west, likewise the footpaths along them. Each cross-drain ran parallel to and at one chain distance from the next, so that the plot was cut up into equal parts which were planted out systematically. The seed-beds were made 20′ x 3′ and light thatched roofs of bamboo and guinea grass were made over them. Cheese-cloth covers were also tried. The thatched roofs were found to be the better. Much trouble was experienced in finding a method of coping with ants taking away the newly germinated seed. However, a method was finally discovered and at all three plots the seedlings came up well: Hope and Temple Hall being the best. At Cherry Garden a number of beds were diseased, and the East Indian planters were shown how to prevent further trouble by spraying with Cheshunt Mixture.

The Machado Tobacco Company kindly supplied a pound of their local Havana seed with which a start could be made. Later, more seed was procured from varous sources. 125 seed-beds were set out and 15 varieties of seed used, as follows:—

H. Havana seed.
M. Havana seed (from Machados).
S. Havana seed (from Hagley Gap).
SR. Havana seed (from Hagley Gap—Havana Resistant).
AV. Avanensis Cuba.
AH. Broad Havana (Slates).
UX. Puerto Rican (esp. 1936).
V. Puerto Rican (V-9).
S30. Puerto Rican (cross UX exp.)
B. Cuban type.
HV. Havana (from Vuelta de Abajo).
AH. Large type Havana (Slates).
CS. Large type Comstock Spanish (Slates).
A. Local Cuban, as planted by most growers, (Jamaica Agricultural Society).
SM. Imported Sumatra (Slates).

The imported Havana and Machado's seed proved the best of the Havana types, and very large plants were obtained from the Puerto Rican types. The Sumatra type also did well, and some very fine leaves were produced. The Comstock Spanish, AH, S and SR were not at all satisfactory, and the local Cuban was poor. The amount of seeds used for the 125 seed-beds was 1½lbs., which amazed the local planters who are used to sowing their seed in handfuls and trusting to luck that they germinate. Their seed is of poor quality and nothing is done to keep ants and birds away; fungus diseases also attack their seed-beds and they do not know how to prevent this. It is hoped that many of them will now have learnt a little from what they have seen.

3. The new methods certainly are more expensive at first, but so many planters have to buy suckers with which to plant their fields, that it has been pointed out to them that a little extra care and expense for seed-beds will repay them. The seedlings produced at both Hope and Temple Hall were excellent and proved conclusively to the planters that their methods are primitive. Planting was carried out according to the Sumatra method, that is, the double-row system. For the Puerto Rican types, this double-row system must be changed as the leaves of these plants are too large. Next year the single-row system will be used for these types. All moulding was done by hand and it took some time to teach the labourers to do this quickly and neatly as they seemed unused to wielding a how in the proper manner. To do moulding cheaply, it will be necessary to use a double mould board plough.

4. Planting was started about a month earlier than is usual as it was considered advisable to finish all planting before the drought set in. Many planters do not finish planting before January and they nearly always find that the latter half of their crop suffers from drought. The weather happened to be very propitious throughout the whole of the planting time and nothing was lost either through heavy rain or drought. At Temple Hall the yield was very good; also at Hope the plants grew well; but at Cherry Garden the soil was very poor and, in spite of fertilizing, rather a poor crop resulted, and many plants died from root-rot. To cut down expenses, the plot at Cherry Garden was worked on almost the same lines as the local planter works his plot, and it proved definitely that poor land has to be well worked and looked

after to produce a good crop. This land had been used the previous year for tobacco and nothing had been done to prevent erosion of the soil and no cover crop had been planted to put back a little of what had been lost. However, in spite of these failings, the crop produced per acre was twice the quantity of other growers nearby. Freshly imported seed was to a large extent responsible for the better crop and it is to be hoped that the seed to be distributed next year will give better results all round.

5. All the experimental planting was finished by the middle of December and the first cut tobacco was drying up well. The existing barns had to be enlarged to accommodate the crop and much of the Temple Hall crop was harvested overripe before the barn extension was completed. Seed trees were chosen from the best grown and most suitable types, and all tops were bagged to prevent cross-pollination. Seed was not collected from the coarse-leaved broad Havana and Comstock Spanish plants.

6. *Registered Growers.*—Twenty growers were registered as contractors to the Government and special agreement forms were drawn up for them to sign. Up to £12 per acre was advanced to each grower, in monthly instalments of about 30/- per acre, and from this advance their rents were paid quarterly. Each grower has to satisfy the Tobacco Specialist, or his two assistants, that cultivation was fully advanced, and that planting was progressing favourably before any further advances could be made. One registered grower failed to keep up to the mark and he repaid all monies already advanced on demand. Another grower failed to plant his full allotted acreage and all further advances were consequently stopped. 25,000 suckers were distributed to the growers and all have collected seed from these plants for use next year. The total acreage under cultivation by the registered growers was 131 acres but only 119 acres were actually planted by the end of December. These planters were from various districts: 12 from Cherry Garden, 2 from Constant Spring, 1 from Golden Spring near Temple Hall, 2 from Rock River, 2 from York Pen and 1 from Mona who eventually resigned his contract. The crops looked fairly good and the weather was favourable for tobacco growing all through, so high yields ought to result, though the local Cuban type planted is not very large but ratoons well. Most contractors have tried to plant earlier and have followed my advice as much as can be expected the first year. Most of them are very conservative and will only believe when they see any good results. All contractors' fields were visited regularly, and other non-contractors, who wished to sell through the Government, were visited from time to time and advised as to what they should do.

7. *Miscellaneous.*—A considerable amount of correspondence was received and replied to, and tobacco circulars were published in the Agricultural Journal from time to time for all interested planters to read. From these it was hoped that all classes of tobacco planters could gain information as they were written plainly in simple language. Many circulars were also sent out to those who asked for them. Plans for a new Tobacco Grading Station were made and approved. This building will be capable of holding 100,000 lbs. of tobacco. Further buildings will be required later.

F. W. Winckley,
Tobacco Specialist,
1st March, 1937.

Summary of Report of the Tobacco Specialist.

1. *General.*—As a result of the new Tobacco Scheme under the Agricultural Development Board Programme, a Tobacco Specialist was appointed and he arrived early in July.

2. *Experimental Plots.*—Three experimental plots of two acres each were selected in St. Andrew and other small plots were selected in St. Elizabeth, Manchester and Portland. Modern methods of preparing seed-beds and planting were used, and high yields were obtained at most of the plots. The weather was very propitious and no serious diseases appeared. Seed was collected from the best and most suitable types of plant for distribution the following year.

3. *Registered Growers.*—20 planters were registered as Government contractors and a total of 131 acres was cultivated, though finally only 119 acres were actually planted. Loans were given to these planters to enable them to cultivate and harvest their crops for marketing through the Government Tobacco Station.

4. *Miscellaneous.*—Great interest was shown in the tobacco scheme and numerous letters asking for information were received and replied to. Tobacco circulars were published in the Agricultural Journal from time to time and many circulars were sent out to those interested. Plans for a new Grading Station were made and approved.

Office Inspectors of Produce, Public Buildings,
Kingston, 3rd March, 1937.

(*XI*) *Report of Chief Inspector of Produce.*

Hon. A. C. Barnes, C.M.G.,
Director of Agriculture,
Hope, Kingston.

Sir,

I have the honour to submit a preliminary Report on the working of the Produce Inspection Division of the Department of Agriculture for the year ending December, 1936.

The activities of this Division extended in many directions and it would be easiest, perhaps, to mention briefly these activities under minor heads.

1. *The Produce Law, its amendments and additions to its Schedules.*—During the year the Law was amended in the Legislative Council to make more comprehensive control of produce under Class 2 (citrus and bananas). This was thought desirable in order to prevent breach of contract, praedial larceny and illegal purchase of produce. The cost of licenses was also reduced by the Legislative Council from £5 to £2 10s. per annum. In the financial year 1935 there was collected £7,086 5s. for licenses as against £6,217 8s. to date.

Limes and Vegetables of all kinds were added to the Sixth Schedule of the Law during the year, which gives Government control of these products.

Regulations were also drafted and gazetted, controlling the export of limes and vegetables. In the case of vegetables, it is required that these must be packed either in a Government packing house or under the control of a Government Officer.

2. *Bananas.*—Sustained effort by the Inspectors has been directed as in past years, to the control of the export of bananas by the elimination of bruised, poor, thin and otherwise unmarketable fruit. This has had marked effect on the quality of fruit exported by the Companies operating in the Island. It is admitted that this work has saved the growers of bananas a very substantial sum of money. Rejections for damaged fruit alone before the operation of the Produce Law has been estimated to be not less than 5% of our total export. This has now been virtually reduced to nil.

New duties have recently been added to those of the Produce Inspectors in the banana trade in that in the recommendations of the Banana Commission, the Produce Inspectors are called upon to arbitrate differences of opinion with regard to the quality of exportable fruit between the United Fruit Co. and the Jamaica Banana Producers' Association.

3. *Citrus.*—The closest attention is being paid to the reaping, transport and packing of fruit. The value of this work is clearly shewn in the excellent reports from New Zealand on our fruit arriving in in that market.

4. *Pimento, Coffee, Cocoa, Annotto and Ginger,* have received special attention by Produce Inspectors. Efforts have been directed toward better curing, better grading and better packing of such produce. Where produce is found by an Inspector to be unfit for export, it is promptly destroyed under powers given such Inspectors by the Produce Law. In other cases where produce can be re-conditioned, such re-conditioning is ordered subject to re-examination by the Inspector.

There are about 1,000 produce dealers in the Island, handling these products, whose premises, produce and books are inspected at regular intervals by Produce Inspectors.

5. *Court Cases and destruction of Produce.*—There were 30 cases brought before the Courts by Produce Inspectors during the year, in the main for breaches of the Banana Regulations. Such cases are valuable in that they serve as a deterrent to others who would be inclined to be careless in complying with the Regulations under the Produce Law.

The Inspectors destroyed, stopped from shipment, or had re-conditioned for shipment, produce of the following classes during the year:—

Produce.	Destroyed.	Reconditioned.	Stopped from Shipment.
Bananas ..	..	..	33,449 stems
Citrus Fruit ..	1,627½ boxes	5,875 boxes	704¾ boxes
Coffee ..	4 bags	1 bag	6¼ bags
Cocoa ..	63 "	¾ "	..
Pimento ..	1 "	27 "	..
Annatto ..	11¼ "	5 "	..
Ginger ..	..	48 "	..
Honey ..	5 casks	183 casks	..
Orange Oil ..	34 quarts	..	..

6. *Produce Board.*—The Produce Board, under the Chairmanship of the Hon. Sir Alfred D'Costa, Kt., has met on an average, one a month when matters pertaining to the control of our agricultural exports have been discussed and directed in so far as such control comes within the scope of the Produce Law.

The export of citrus fruit to New Zealand was allotted among the shippers on a basis of a total export of 50,000 cases, and quotas granted to such shippers who could show that they had made suitable arrangements for the transport in refrigeration of such shipments as they proposed to make.

7. *Staff.*—On the 1st April, 1936, the control of the staff of this Division passed from the Produce Board to the Director of Agriculture, this placing the Inspectors of Produce in line with other members of the Government service.

The staff of this Division consisted of the following members:—

P. W. Murray ..	Chief Inspector of Produce
H. G. Coote	Inspector of Produce
R. C. Somerville	Do.
A. M. Douet	Do.
H. B. Monteith	Do.
Ian H. Campbell	Do.
C. M. G. Purchas	Do.
U. Foster Davis	Secretary
C. D. Levy	Typist and Stenographer
R. Waugh	Messenger.

Leave was granted to the following members of the staff during the year:—

	Deptl.	Sick.	Vacation.
P. W. Murray ..	9 days	10 days	..
H. G. Coote ..	6 "	..	3 weeks
R. C. Somerville ..	4 "	5	..
A. M. Douet ..	9 "	..	3 weeks
H. B. Monteith ..	1 "	2 days	3 "
I. H. Campbell ..	1 "	13 "	..
C. M. G. Purchas ..	3½ "	5 "	4 mths.
U. Foster Davis ..	11 "	8 "	3 weeks
C. D. Levy	14 "	1 "	3 weeks.

I regret very much to report the great loss sustained by this Division during the year by the death of Mr. H. G. Coote, who died on 29th December, 1936, Mr. Coote was seconded from the Department of Agriculture in 1926 when the work of the Division was first started and his unfailing and conscientious service contributed in a large measure to the success which has attended the operations of the Produce Law.

I have the honour to be,
Sir,
Your obedient Servant,

P. W. MURRAY,
Chief Inspector of Produce.

XII.—*Report of the Deputy Island Chemist.*

The total number of samples analysed during the year ended 31st December, 1936, was 4,698, and compares with former years as under:—

1932.	1933.	1934.	1935.	1936.
3,286	3,905	3,639	3,895	4,698

The samples are classified as follows:—

"A." OFFICIAL SAMPLES.

(1) *Police, Criminal and Toxicological—*	
Human Viscera and Organs	187
Vomits	14
Faeces 1, Urines 2	3
Animal Viscera for poison	2
Substances and articles examined for poison	216
Exhibits in Murder Cases:	
Automatic Pistols 2, Revolvers 2	4
Shot Guns	1
Cartridges 14, Cartridge cases 5	19
Bullets 5, Shells 10	15
Shots 1, Rags 1	2
Cutlass 1, Knives 2	3
Sticks 1, Chips 1	2
Exhibits in Cases of Criminal Abortion	12
Under the Coining Laws.	
Coins, Genuine	272
Coins, Counterfeit	447
Currency Notes, Genuine	1
Counterfeiting Exhibits, Moulds, Metals, etc.	491
Under the Dangerous Drugs Law.	
Opiums	17
Substances tested for Opium with negative results	19
Opium Exhibits, Pipes, etc.	119
Ganga	438
Ganga Exhibits, Pipes, Rags, etc.	63
Under the Spirit License and Rum Duty Laws.	
Rums	66
Whisky 5, Gin 7, Bandy 1	13
Liqueurs 2, Bay Rums 4	6
Under the Medical Laws.	
Medicines and Herbs 9, Pills 9	18
Under the Petroleum Laws.	
Kerosines	4
Under the Gunpowder and Firearms Laws.	
Gunpowder 1, Revolver Cartridges 200	201
Under the Drugs and Poisons Law.	
Drugs, Chemicals, etc., 11, Medicines 2	13
Under the Sugar Control Law.	
Sugars	1
Exhibits in Arson Cases:	
Clothing, Burnt Residues, etc.	150
Gasolines and Kerosines	4
Exhibits in "Obeah" Cases	42
Total	2,865

(ii) *Customs and Excise*—	
Absolute Alcohols and Rectified Spirits	10
Denatured Alcohols and Methylated Spirits	35
Native and other Wines	58
Rum Punches	85
Flavouring Extracts and Essences	17
Fuel Oils	60
Gasolines 1, Turpentines 1	2
Insecticides, Disinfectants and Wood Preservatives	23
Medicines 7, Chemicals 3, Culture Media 5	15
Fabrics, Silks, Cotton, etc.	133
Condensed Milks 2, Food Colourings 2	4
Paper and other bags for exporting Produce	4
Miscellaneous:	
Feeding Stuffs 2, Preservative Powders 2, Honey 1, Beeswax 1, Invert Sugars 1, Bay Rum 1, Porter 1, Sands 2	11
Total	457
(iii) *Department of Science and Agriculture*—	
Animal Viscera for Poison	3
Feeding Stuffs 1, Waters potable 1	2
Orange Oils 2, Oranger Oil Emulsions 2	4
Plant Specimens (Night Shade)	2
Denatured Alcohols	1
Total	12
(iv) *Island Medical Department*—	
Drugs and Chemicals	5
Condensed Milks	4
Waters, potable	1
Soap	1
Cakes 2, Cocoa 1, Buns 1, Dough 1, Fish 1	6
Fresh Milks: Genuine 4, Adulterated 3	7
Total	24
(v) *Department of Public Works*—	
Native Corns	49
Waters, potable	4
Light House Oils	2
Concretes 3, Marls 4	7
Total	62
(vi) *Jamaica Government Railway*—	
Engine Oils	2
(vii) *Education Department*—	
Foodstuffs (specimen lunch)	1
(viii) *Kingston and St. Andrew Corporation*—	
Waters: potable 1, Crude Tars 2, Red Earths 1	4
Total Official	3,427
"B" General Samples.	
Fresh Milks, Government Stock Farm	1,012
Fresh Milks, Private Producers	11
Cattle Dips	52
Sugars	22
Rums	98
Waters, potable	13
Feeding Stuffs and Coconut Meals	3
Condensed Milks 2, Rum Colourings 3	5
Edible Oils	3
Bay Rums 3, Wines 2	5
Corns 4, Malts 1	5
Fruit Juices 2, Honey 1	3
Animal Viscera for Poison	1
Substances for Poison:	
Horse Saliva for "Dope" 1, Coffee Ground 1, Whisky 2 Vegetable Extracts 1, Foods 1, Cow Dung 1	7
Medicines, Private Persons	3
Ores, Minerals, and Deposits	7
Encrustations from Metals	7
Miscellaneous:	
Charcoals (carbons) 3, Solders 3, Soap Lyes 2, Powder ex hold of Ship (Chloride of Lime) 1, Plant Specimens 5	14
Total	1,271
Grand Total	**4,698**

Official Samples.

The 187 analyses of human viscera and organs, and 14 vomits were made in connection with 113 deaths. In 41 cases positive results were obtained in the viscera as follows:—

Human Viscera and Organs.

(1) 20 grains Arsenic and Cresols from organs of a female adult suicide.
(2) Large traces Oxalic Acid from viscera of a female child.
(3) Large traces Arsenic from organs of female child.
(4) Large traces Arsenic from organs of female child.
(5) 0.004 grains Arsenic from organs of female adult.
(6) Antimony equivalent to 0.07 grains Tartar Emetic from viscera of male adult.
(7) Large traces Antimony in viscera of a male adult.
(8) 2.34 grains Opium Alkaloids from viscera of a male adult.
(9) 0.056 grains Antimony in organs of a male infant.
(10) 0.225 grains Antimony in organs of a female infant.
(11) Traces Antimony in viscera in female adult.
(12) 1.7 grains Arsenic and Cresols from organs of female adult suicide.
(13) Traces Mercury from the viscera of a female adult.
(14) 0.055 grains Phosphorus from the organs of female adult.
(15) 0.063 grains Phosphorus in viscera of a male child.
(16) 0.05 grains Phosphorus in organs of a female child.
(17) 49 minims Alcohol from organs of a male adult accidentally killed by motor car.
(18) Oil of Chenopodium from viscera of a male child.
(19) Oil of Chenopodium from viscera of female child.
(20) Large traces Arsenic from organs of female child.
(21) 0.003 grains Arsenic from viscera of a female child.
(22) 0.006 grains Arsenic from organs of a male child.
(23) 0.045 grains Antimony from viscera of a male adult.
(24) 0.003 grains Arsenic from organs of male child
(25) 12 grains Arsenic and 52 grains Cresols from organs of a male adult suicide.
(26) Traces Arsenic in the viscera of a male adult.
(27) 25 grains Potassium Cyanide in the organs of a male adult.
(28) 15 grains Arsenic from the organs of a male adult suicide.
(29) 28 grains Resinous matter of the nature of Mammee Sapota gum in a male child.
(30) Antimony equivalent to 2.7 grains Tartar Emetic in organs of a male adult.
(31) 0.98 grains Strychnine in viscera of a male adult.
(32) 0.3 grains Strychnine in viscera of a male child.
(33) ½ oz. Cresols from organs of a male adult suicide.
(34) 0.21 grains Mercury from viscera of a female infant.
(35) 0.1 grains Mercury from organs of a male infant.
(36) 2.34 grains Mercury from viscera of male adult.
(37) 0.49 grains Phosphorus from viscera of a male adult.
(38) 0.013 grains Phosphorus from organs of a male child.
(39) Large traces Nitric Acid from the viscera of a female adult.
(40) 0.5 grains Oxalic Acid from the organs of a female adult.
(41) 1.0 grains Oxalic Acid from the organs of a female child.

Negative results were obtained in 72 cases.

Vomits.

Results were obtained in the vomits as follows:—

(1) Hydrocyanic Acid.
(2) Opium Alkaloids.
(3) 0.00045 grains Arsenic.
(4) Large traces Arsenic.
(5) 0.29 grains Strychnine.
(6) 0.185 grains Strychnine.
(7) 0.355 grains Strychnine.
(8) Mercury (White Precipitate).
(9) Potassium Permanganate.
(10) Mercury (Red Precipitate).

Negative results were obtained in 4 cases.

Substances examined for Poison.

216 substances and articles examined in connection with 62 different cases gave results in 27 cases as under:—

(1) Arsenic (Cattle Dip) in a cup and two bottles of liquid in a case of suicide.
(2) Large traces Arsenic in a measuring glass and tumbler.
(3) Tincture of Opium in a drinking glass and 2 bottles of liquid.
(4) 9.5 grains Powdered Glass in cooked food.
(5) Large traces of Arsenic in Butter.
(6) Arsenic ("Rough on Rats") in a powder.
(7) Arsenic ("Rough on Rats") in an enamelled mug.
(8) Powdered Glass and "Cowitch" hairs in a mug and spoon.

(9) Jeye's Fluid in a bottle of liquid suspected to contain Cattle Dip.
(10) 0.39 grains Phosphorus in a pot of water.
(11) Powdered Glass in a sample of Cake.
(12) Powdered Glass in a sample of Bread.
(13) 0.6 grains Phosphorus in a jar of drinking water.
(14) Indigo in a tubler of liquid suspected to have been poisoned.
(15) 11.8 grains Powdered Glass in cooked food.
(16) 25 grains Powdered Glass in soup and traces in a mortar.
(17) Tartar Emetic in a liquid suspected to have been poisoned.
(18) 0.355 grains Strychnine in the remains of a bottle of Stout which caused the death of two persons and violent symptoms in two others.
(19) Powdered Glass in cooked food.
(20) Mammee Gum in specimens submitted in a case of suspected poisoning by that substance.
(21) "Dumb Cane" in two waters.
(22) Cresoles in a bottle of liquid, glass, and milk in a case of suspected suicide.
(23) Large traces of Mercury in a basin which had contained vomit.
(24) Potassium Permanganate on the garments of an attempted suicide.
(25) Mercury (Red Precipitate) in two tin cans and on two sheets in a case of attempted poisoning of two children.
(26) Hydrocyanic Acid (Bitter Cassava) in food used to destroy pigs.
(27) Perfumed Gum in Candy alleged to have been used in an attempt to procure abortion.

Police, Criminal and Toxicological.

454 Certificates were issued to the Police Department, being an increase of 59 over the previous year.

The analyses of human viscera and organs in cases of suspected poisoning showed a decided increase over the previous year, being 187 as against 164, an increase of 23.

Examination of exhibits in murder cases shows a slight increase over last year, and continues to increase steadily from year to year.

216 substances and articles were examined for poison, an increase of 56 over 1935.

A total of 1,211 exhibits were submitted in connection with breaches of the Coin Law, an increase of 625 over last year. Included in this total were 447 counterfeit coins, and 491 articles used for making base coins, such as moulds, metals, chemicals, etc., an increase of 275 and 250 respectively over last year.

The practice of silver plating base coins appears to be steadily growing, and amongst the exhibits examined were such dangerous chemicals as Potassium Cyanide, Nitric and Hydrochloric Acids. The Police are to be congratulated on the dertermined efforts displayed in bringing most of the counterfeiters and utterers of base coin before the Courts resulting in a record number of convictions during the year for this class of crime.

Opium and Opium exhibits numbered 155, being an increase of 59 over last year.

Ganga and articles used in the smoking of Ganga showed a decrease from 601 to 501 for this year.

85 samples submitted under the Spirit License Law showed an increase of 34 over last year.

Exhibits under the Medical Laws showed a decrease fron 55 to 18.

Arson exhibits numbered 154 as against 21 for last year, and comprised various articles of clothing, burnt residues, etc., which had been treated with inflammable petroleum.

201 exhibits submitted under the Gunpowder and Firearms Law comprised a large sample of Gunpowder and 200 revolver cartridges of various makes seized in a raid.

Customs and Excise.

The work done for the Customs Department showed a slight decrease this year being 457 samples as against 482 for the previous year, and included 133 Fabrics for analysis and classification.

The usual determinations of the alcoholic contents of various spiritous compounds exported, for the purpose of assessing the amount of refund of duty on the alcohol used in their manufacture were carried out.

Various Flavouring Extracts and Essences were tested for alcoholic strength, and for prohibited constituents in the interest of Public Health.

Most of the other analyses carried out for this Department were mainly in connection with the determination of the nature of the articles with a view to their classification under the Tariff Laws, and call for no special comment.

Other Government Departments.

Three analyses of animal viscera for suspected poison were carried out for the Department of Science and Agriculture, and result in the detection of "Nightshade" poisoning in one case.

A sample of water submitted from Grand Cayman through the Department by His Excellency the Governor, was found to be non-potable, and therefore useless as a potential supply for that Island.

Of 62 samples submitted by the Public Works Department, 49 were of Native Corn in connection with contracts made by the Department for the more general use of this article, and showed that a high standard was being maintained.

Four samples of water were analysed in connection with contemplated new water supplies.

Four samples of Marl were examined in an effort to find out if there use could have resulted in certain defects which showed up in cement work of a certain Public Building.

Most of the other samples analysed for various Departments were such as involved routine work of a nature which calls for no particular comment.

GENERAL SAMPLES.

1,012 samples of Fresh Milks analysed under this head consisted of Milks from the Government Stock Farm, and the results obtained continue to point to the high quality of this supply to the various Public Institutions catered for.

52 sample of liquid from Cattle Dipping Tanks were tested, and the usual recommendations made for bringing tanks to correct strength.

98 samples of Rum were analysed as against 66 for last year, involving in most cases complete analyses to meet the more exacting requirements of most rum importing Countries.

Sugars tested were 22 as against 77 for last year. The decrease appears to be due to the fact that most Sugar Estates now have their own Chemists who carry out routine tests.

13. samples of Water were examined for various persons to ascertain their suitability for use as domestic supplies.

Seven exhibits were examined for private persons for the presence of poison. In no case was poison detected.

Encrustations from seven consignments of Galvanized Sheets were submitted for analysis to ascertain whether the damage had been caused by sea water. In all cases it was found that sea water was not responsible, and that the damage had probably been caused by the sheets having been stored in proximity to various chemicals.

Of the 14 miscellaneous analyses, one sample called for the analysis of a powder from a ship's hold from which large volumes of gas were being emitted. The gas having been found to be Chlorine, and the powder Chloride of Lime, recommendations were made for suitable appliances to be obtained from the Kingston Fire Brigade, and a situation which threatened to hold up the ship for some days was averted.

The manufacture of Paranaph and Fly Killer was continued throughout the year. Whilst the amount of Paranaph sold to the Public remains about the same as last year, the sales of Fly Killer show a steady increase over all previous years.

2,183 letters, orders, etc., (a decrease of 4 from last year), were received and dealt with during the year. This number is not inclusive of personal orders dealt with.

The following Table shows the nature and amounts of materials supplied to the public for the past five years, also the amounts collected in fees and for sales during the same period.

Items.	1932.	1933.	1934.	1935.	1936.	Weight.	Remarks.
Paranaph ..	34,964	39,850	33,373	36,654	35,942	lbs.	
Arsenite of Soda ..	22,021	24,818	20,300	21,200	19,736	lbs.	
Copper Sulphate ..	567	8	4	..	..	lbs.	Sale discontinued.
Carbon Bisulphide ..	1,174	2,010	1,164	1,338	866	lbs.	
Rat Poison, bulk ..	225	210	130	183	183	lbs.	
Rat Poison, 1 oz. packets	170	Nil	550	301	70	pkts.	
Thymol Powders ..	441	393	248	167	230	ozs.	
Standard Iodine Solution	40,750	45,000	34,500	36,000	29,750	cc's.	
Starch Solution ..	209	245	196	187	161	bottles	
Soda Bicarbonate ..	30	44	31	42	31	bottles	
Cyanagas	42	29	25	273	187	lbs.	
Fly Killer ..	132	229	332	349	430	gallons	
Laboratory Fees ..	£221 10 9	£179 8 0	£240 1 0	£143 9 0	£184 5 6	..	
Laboratory Sales ..	£928 13 11	£1,073 8 2	£923 19 0	£996 6 1	£995 0 0	..	

Staff.—During the year Mr. W. L. Barnett, Deputy Island Chemist, was absent on vacation leave from 1st July, 1936 to 25th January, 1937, and during this period Mr. E. N. Richards acted as Deputy Island Chemist.

Mr. L. A. Boothe, Clerk and Storekeeper, acted at the Head Office of the Department as Financial Clerk, from 3rd to 24th March, during which time Mr. D. C. Davis, Technical Assistant, carried out the duties of Clerk and Storekeeper.

Mr. E. N. Richards was absent on two weeks vacation from the 26th May to the 8th June.

Mr. E. K. P. Blake, Technical Assistant, was absent on vacation leave from the 2nd December, 1935 to 5th January, 1936.

Mr. G. A. Little and Mr. R. D. Hill, Apprentices, were appointed Technical Assistants on the 1st April and the 26th June, respectively.

The Staff of the Chemistry Department consists of the Deputy Island Chemist, Assistant to the Deputy Island Chemist, Four Technical Assistants, one Apprentice, and Clerk and Storekeeper.

W. L. Barnett,
Deputy Island Chemist.
23.3.1937.

XIII.—*Annual Report of Plant Pathologist and Officer-in-Charge of Low Temperature Station for* 1936.

(a) Plant Pathologist.
(b) Officer-in-charge, Low Temperature Station.
(c) Secretary, Advisory Committee on the Banana and Citrus Industries.
(d) Inspector of Plant Imports and Exports.
(e) Citrus Development Loan Board.

The activities of this Division of the Department during the period under review included Plant Diseases, Low Temperature investigations, marketing development work with new crops, the organisation and supervision of vegetable growers and the operation of the Government Citrus Packing House, while the whole of the Secretarial and Accounting work in connection with the Citrus Development Loan Scheme continued to be undertaken in this office. Inspection of plant imports and exports continued to be operated from this office also. The frequent calls upon the time of the Plant Pathologist for various other duties coupled with the lack of senior staff in the Division resulted in a considerable curtailment of the original programme, and experimental work suffered severely in consequence.

2. *Title of Office.* –It was decided by Government, at the suggestion of the Secretary of State for the Colonies, that the title of Government Microbiologist should be changed to Plant Pathologist. This was brought into effect on April 1st 1936, although the duties remained unchanged and continued to include many phases of work in no way connected with the normal duties of either the old or new title.

3. *Investigations Abroad.*—During the early part of January the Plant Pathologist visited Canada in connection with the Citrus Industry. A further visit to Canada and the United States was made in September at the request of the Agricultural Development Board, to make enquiries concerning equipment for a vegetable packing house and cannery. A four weeks tour of Panama, Honduras, Guatemala and Cuba was undertaken with the Agricultural Chemist in November–December, to examine experimental work in progress in these countries more especially that connected with Leaf Spot Disease and breeding work in bananas. Special reports have been submitted in connection with these tours.

4. *Committee and Special Duties.*—The Plant Pathologist continued to be Secretary of the Advisory Committee on the Banana and Citrus Industries and Chairman of the Citrus Development Loan Board. Special reports of the activities of these two Boards are given as appendices to this report. The same Officer continued to be a member of the Banana Industry Aid Board which completed the distribution of loans to banana planters who suffered in the 1935 hurricanes and continued to make collections from the loans granted in 1932, 1933 and 1934. The Plant Pathologist was appointed Vice-Chairman of the newly constituted Citrus Control Board but this body being appointed after the Citrus season had commenced did not start any active functions during 1936. He was also appointed to the Advisory Committte on the Citrus Packing House and to the Permanent Exhibitions Committee which dealt with Jamaican exhibits at the British Industries Fair and the Imperial Fruit Show in London. The Plant Pathologist was appointed Liason Officer to the Jamaica Banana Commission and made several special reports to that body. He was also called upon to be Government representative attending meeting of the Board of Directors and Executive Committees, both of the Jamaica Citrus Producers' Association and the Jamaica Banana Producers Association until June 1936, when it was considered unnecessary for such attendance at meetings to be continued. Further negotiations in connection with the edible Coconut Oil manufacture and sale by quota were also carried out in association with the Director of Agriculture.

5. *Staff.*—Consideration of the appointment of an Assistant Plant Pathologist was deferred, while the question of the appointment of a Marketing Officer was brought into a more general development scheme under consideration by the Agricultural development Board. In spite of the non-provision of this extra senior staff the large variety of work of this Division was continued as completely as possible and I desire to record my sincere appreciation of the loyalty and hard work of the whole staff associated with this Division which alone has made it possible to carry out even the restricted programme.

6. Mr. J. M. McEwen (D.I.C.T.A.) Junior Agricultural Officer continued to deal with Plant Import and Export inspections and the increase in the importance of this work is reflected in his report. Mr. H. G. Miller (D.I.C.T.A.) Junior Agricultural Officer, was transferred to the Agricultural Chemist's Division at the close of the 1935-36 vegetable season and his place was taken by a temporary officer, Mr. Baker. Mr. Miller returned to the Division at the end of the year and together with Mr. N. E. C. Thompson who was specially seconded, began spraying trials and general work in connection with the outbreak of Leaf Spot disease of bananas in St. Andrew and St. Catherine.

7. Mr. E. A. Tai (D.I.C.T.A.) Junior Agricultural Officer, has been responsible for attending to general plant disease experiments both in the field and the Low Temperature Station. Mr. R. C. Bridge, Technical Assistant, received well merited promotion to Junior Agricultural Officer and has attended to field work with vegetable growers in which he has been highly successful, while Mr. Z. A. Daniels, Technical Assistant, has attended to the Packing House and numerous other duties.

8. Mr. A. G. Squire was appointed part time Manager of the Citrus Packing House under this Division of the Department. Mr. E. Strachan was appointed Foreman, and Mr. L. Heron Assistant Foreman. I desire to record appreciation of the work and long hours of duty put in by these officers during the rush periods in October and November.

9. Mrs. B. Vernon continued as clerk at the Low Temperature Station.

Plant Diseases.

11. Plant diseases were more conspicuous during 1936 than in recent years, probably due to the unusually distributed rainfall. The more outstanding troubles proved to be Pimento Rust (Puccinia Psidii), Bacterial Bud Rot in Coconuts and latterly Leaf Spot of Bananas (Cercospora musæ). With the development of vegetable growing the diseases of these crops have become more conspicuous and important.

12. *Bananas.*—Panama Disease (*Fusarium oxpsporum cubense*). The modified method of treating only the affected root in all districts where the disease is at all frequent has given some temporary relief although many planters have decided to continue or revert to the former 9-root system of quarantine. The losses from the disease in some districts have been disastrous especially in the newer plantings in Vere and St. Catherine, and it is apparent that the critical time is rapidly approaching when exports will be affected. It is true that the export figure has been maintained at a high level by bringing new lands into cultivation but the major problem in all further development is that of providing healthy planting material. The disease is so widespread in the Island that absolutely healthy seed material is now impossible to obtain.

13. The situation in the parish of St. Mary is rapidly becoming more serious. The larger planters still have some reserves of new land but as a whole the small settler element has suffered severely from the disease and has no longer any reserves of land to fall back upon. Planters in this area are also timid to plant new lands as, apart from the difficulty of obtaining healthy seed material, experience has clearly shown that the disease almost always appears prolifically in all fresh plantings in new lands and re-plants in old lands. The large quantities of semi-decayed plant material present in the soil under such conditions, coupled with the æration produced with the preparation of the land for planting, undoubtedly has a direct influence on the growth of the fungus in the soil resulting in an abundance of the parasite in an active condition which might be expected to produce a high degree of infection in the young plants. When the fungus foods in the rotting plant material have been exhausted and as the soil resettles to a less ærated condition, activity of the fungus in the soil is likely to be reduced with a corresponding effect upon disease incidence.

14. A similar situation exists in parts of St. Catherine, St. James and Clarendon, and the provision of either a new banana, resistant to the disease or an alternative crop, is now very urgent. Both possibilities are still remote although investigations are being pressed forward and so a bold agricultural development investigational programme is essential and imperative. The planting of land subject to flooding is highly undesirable.

15. The situation in regard to Panama Disease was reviewed in detail in a special report submitted to the Jamaica Banana Commission, and for ready reference the summary of estimated losses of land are given again in this report. It should be realized however, that the number of recorded cases coming to the notice of the Department gets steadily more inaccurate every year and in all probability the figures now received will represent not more than 60% of the actual diseased trees. This is partly due to inaccurate reports and the difficulty of giving true figures in partly abandoned areas, and to the fact that planters in many cases no longer report regularly and correctly. The stage however has now been passed when forty or fifty thousand diseased plants one way or another per annum make a great deal of difference to the situation.

16. Details of the cases recorded for 1936, are given in my Report as Secretary of the Advisory Committee on the Banana and Citrus Industries.

PANAMA DISEASE OF BANANAS IN JAMAICA.

Estimated Position in regard to Losses of Land from Panama Disease at December, 1935, as compared with December, 1931.

Parish	Diseased Plants Recorded.		Banana Land Lost through Panama Disease to Dec., 1931.	1932 to 1935		Grand Total to 1935.
	1912 to 1931	1912 to 1935.		Land Lost in Quarantine Areas.	Abandoned Lands (Est.).	
St. Mary	139,994	718,642	3,776 ac.	4,100 ac.	5,000 ac.	11,626 acs.
St. Ann	16,346	46,324	497	280	100	897
Trelawny	2,075	9,388	65	102	20	182
St. James	48,337	129,047	660	970	600	2,080
Hanover	3,679	5,883	141	35	12	185
Westmoreland	3,126	8,524	130	105	60	280
St. Elizabeth	75	866	4	18	..	22
Manchester	662	4,966	24	71	..	95
Clarendon	14,484	78,010	380	849	800	1,829
St. Catherine	18,391	105,051	459	911	1,811	2,270
St. Andrew	378	6,322	17	118	100	210
St. Thomas	25,933	65,152	507	506	200	1,163
Total Parishes other than Portland	..	..	..	..	..	20,839 acs.
Portland	..	..	9,000	3,000	..	12,000 "
Full Total to Dec., 1935 ..	..	..	..	..	..	32,839 "

Note:—Only a portion of the figures for abandoned lands is used in the grand totals.

17. *Leaf Diseases.*—Diseases affecting the leaf of the banana tree have come into great prominence during the year under review. In the years 1933-34, the leaf spot disease caused by *Cercospora musae* and which had previously only been known as a vigorous parasite in Fiji and Queensland, appeared in a virulent form in Surinam and was later identified in Trinidad. In 1935 the same disease was discovered causing some damage in a few locations in Honduras and Guatemala. Later in that year and during the early part of 1936, serious damage became apparent in Honduras and to a lesser extent in Guatemala. Almost simultaneously excessive leaf spot damage was noticed in a few somewhat isolated places in Jamaica in three different parishes not contiguous to one another.

18. For some twenty-five years damage from the Black Spot fungus (Helminthosporium torulosum) has appeared with great annual regularity in certain well known districts, especially during the autumn months, but this disease has never been noticed to develop in any widespread fashion although the degree of intensity has varied from year to year. It has proved by long experience to be a disease of minor consequence and only found in certain districts where conditions are not suitable for bananas, being most prominent during cold, wet autumns and winters. In addition to this disease,the fungus *Cordana musae* has always been universally prominent on all banana leaves during the winter months, when growth is slow. The discoloured blotches caused by it are those associated with the condition known by planters as "winter ing." It has never been regarded as a primary disease or of any economic importance.

19. For several years occasional spots with ashen grey centres have been observed on banana leaves during the winter and Cercospora spores have been found in them. As these have invariably been observed on trees otherwise debilitated and never causing any serious damage, such spots have been classified as of a similar status in importance to the two previously mentioned diseases. The reason for the more intense damage caused by *Cercospora musae* throughout the Caribbean zone in the last two years is yet something of a mystery, more especially as it has appeared in widely separated areas and has left some countries completely uninfected. The possibility of mutation of the fungus and so developing a more highly pathogenic strain must not be ignored but this point represents merely one of a multitude which require close examination and intensive study.

20. So far as Jamaica is concerned it can be stated without exaggeration that the Cercospora disease has not yet exhibited damage in any place to compare with that experienced in Honduras, and there is no evidence of the very speedy spread of the disease in a devastating form similar to that occuring in the Ulua and Chamelicon valleys of Honduras. In fact, although the disease has now been identified in almost every parish of the Island, practically no real damage to the crop has been noted except in instances where there are other factors contributing to the unhealthy condition of the trees. So far it has been observed that the disease only seems to create damage of any account on trees growing under conditions which

produce flashes of soft growth. Such conditions are found in the plains of St. Andrew, Western St. Catherine and in Vere. Similar spasms of soft growth take place in the "shot" soils of the western parishes and on certain heavy hill-top clays, when rains come after spells of dry weather. In such areas definite damage has been observed but when the marketable quality of the fruit has been affected the districts are invariably those in which short-fingered fruit is common in normal circumstances. In the rich clays of St. Mary and other parishes mild infections are common but not a single case of severe damage to the leaves or depreciation in the quality of the fruit as a result solely of the disease has yet been observed.

21. The year 1937, will show whether Leaf Spot disease of Bananas is likely to prove of serious consequence to the Jamaica banana industry or not, and while the situation at present is regarded with great optimism yet precautions have been taken to institute spraying trials, to import spraying equipment and to make observations and investigation which will place the Department in a position to handle the situation should the necessity arise. The United Fruit Co., is also carrying out extensive experiments based on experiences obtained in Central America.

22. *Sugar Cane.*—There has been no spectacular outbreak of disease in the sugar crop. The usual complaints concerning Root diseases have been received from time to time from the western parishes, but no serious cases have been observed or reported. Mosaic disease has been slightly more prominent than usual where susceptible varieties are grown, but serious outbreaks are traceable in practically all cases to careless seed selection and lack of nurseries. In some parts of Westmoreland, the practice of growing corn (maize) with the canes was restarted and produced excessive mosaic infections. It was necessary to enforce the Mosaic Disease Order in such districts and propaganda work was set up among the small farmers pointing out the danger of this practice.

23. An interesting case of suspected Pokkah-Boeng disease was investigated in St. Thomas where symptons very similar to this disease had been observed in P. O. J. 2878 and other varieties to a lesser extent. Investigation proved that the peculiar condition was due to a temporary strangulation of the bud when vigorous growth began with rains following a drought. The symptons disappeared after three weeks when more balanced growth was established in the plants.

24. *Coconuts.*—The Bacterial bud-rot has continued to create excessive damage in the Montego Bay—Lucea area. The damage is restricted to the coastal belt to a depth of two or three miles only, but in this area the losses of trees have been very serious. A special inspector has been detailed to the district for the enforcement of plant hygienic methods and experimental work. The disease is so rapid in its appearance and the resultant death of the plant that so far no effective preventitive has been found. The fact that the disease has remained localised to certain coastal districts for several years indicates the presence of factors which predispose the trees to this damage.

25. Ordinary budrot disease has not been conspicuous, while the Leaf trouble which caused so much concern in St. Mary has now practically disappeared.

26. *Citrus.*—Wither-tip disease of limes has been more conspicuous than usual and this has caused planters to take a greater interest in the disease. Extremely good varieties have been obtained on one or two estates where the trees have been thoroughly cleaned up and sprayed and attention paid to cultural needs. The principal loss from this disease in Jamaica is not so much in the damage to young shoots as the infection of flowers and young fruit resulting either in falling of the young fruit or unsightly lesions on the mature limes. This damage causes serious loss of crop in some districts.

27. *Die-Back.*—Die-back of young orange and grapefruit trees, assoiated either with Colletotrichum or Diplodia, has been common especially in St. Catherine. While fungi are usually found to be present in these cases, their functions are essentially secondary. Physiological disturbances and lack of balance between root stock and scion are the normal causes of this type of trouble, and with careful attention to drainage and cultural methods it rapidly disappears as the trees become older.

28. *Knot Disease* continues to give a great deal of trouble in certain parishes on both limes and lemons but insufficient effort is made by planters to bring the disease under control. Careful pruning during the winter, general cleaning of the trees and the immediate destruction by fire of the infected material would reduce damage caused by this trouble to a very small amount, but generally speaking the trees receive inadequate attention and the damage from Sphaerophsis continues to increase. It can be reported, however, that some improvement in the attention given to lime trees is becoming evident, and this is not unconnected with the Department of Agriculture, in its endeavours to improve marketing arrangements for the Jamaica Lime crop. During the coming season it is intended to have a campaign amongst lime growers to induce them to give greater attention to their trees.

29. *Scab Disease* of sour oranges has continued to give some trouble in young citrus trees, but where it is possible to use a certain amount of shade the damage is less apparent. The disease has been reported on grapefruit leaves in very wet areas, but no damage of any consequence has been noticed.

30. *Wastage troubles* in fruit during transport has been less conspicuous than usual, although several reports of high proportion of wastage were received during the wet months of October and November. The use of debuttoning method in the packing house has eliminated Diplodia to a very great extent except where fruit is not processed until it has become stale. Under such conditions the fungus causing the rot has ample opportunity to enter into the fruit before the debuttoning process takes place. Oleocellosis was particularly apparent during the autumn months when the fruit has to be picked during wet weather. A great deal of propaganda is still required to induce growers to take proper care and attention in handling their fruit as it comes off the tree, as at thi s stage the fruit is most vulnerable especially during wet weather when it is turgid and easily damaged. If greater attention were paid to picking, the proportion of fruit which ultimately proves unsuitable for export would be lowered.

Pimento.

31. *Rust Disease* (*Puccinia Psidii*).—The investigations carried out by Dr. J. MacLachlan were brought to a close in June and his final report on the investigations is awaited with interest.
During 1936, the disease again caused considerable damage and loss of crop, while numerous trees dried up and died mainly as a result of defoliation by the fungus. Early observations of the disease indicated that it might have restricted its activities to the elevations above 1,000 feet, but heavey infections were observed

during the summer and autumn months right down to sea level. Towards the end of the year, there was a noticeable improvement in the general aspect of the pimento trees and there would appear to be definite hopes of either a variation in virulence or certain seasonal influences which might make the damage less intense in certain seasons. There are areas, however, where the conditions are normally so favourable to a disease such as this one, and where the trees are so impoverished, that little hope of a return to anything like normal crops can be predicted at any time. Protection of the trees by spraying appears to be an entirely uneconomic proposition.

Vegetable Diseases.

32. *Eggplants.*—With the continued interest in this crop the importance of disease has become very apparent. The principal damage, however, is that caused by *Phomopsis vexans*. Wastage in the fruit after export, due to this disease, was reported in April, May and June in the year under review, and attention was immediately given to possible methods of control. These experiments are continuing and it is hoped that the wastage from this disease may be reduced after a full investigation of the methods of infection has been carried out. With the exception of a certain amount of rotting of the fruit while still on the plant, arising from infection of a species of *Rhizopus*, hardly any other trouble of fungus origin has been noticed on this particular plant but the Root Knot Eelworm and several insect pests have been very conspicuous.

33. *Sweet Peppers* (*Capsicum*).—The plantings of this crop when at their prime show very little damage from disease, but towards the end of the crop severe damage to the fruit by the Anthracnose fungus is always conspicuous. Mosaic disease and physiological troubles such as sun scalding the fruit are common in plantings made in the plains.

34. *Tomatoes.*—Late Blight (*Phytophthora*) proved fairly common in some of the higher districts, but was comparatively rare in the lowlands. The Leaf Mould disease proved to be of considerable importance. Spraying trials were instituted to control this disease, using the proprietary product "Shirlan." The preliminary tests on relatively small plots of about one-tenth of an acre, consisting of five English varieties of tomatoes were made, using one ounce per gallon of Shirland AG on one plot and half an ounce per gallon on the second plot, the third being un-sprayed. Spraying was carried out at fortnightly intervals but no appreciable difference was found between the sprayed and the unsprayed plants due apparently to spraying being made at too infrequent intervals. The second experiment was carried out on a planting of the American variety (Marglobe) and again plots of one-tenth of an acre were used. The first plot was sprayed with Shirland AG at one and a half ounces per gallon, the second with one ounce to the gallon and the third was unsprayed. Spraying was carried out at intervals of seven days from the time the plants were four weeks old, and when Leaf Mound disease had started to appear. After the third application a distinct difference between the sprayed and the unsprayed plants was noticeable, and as time went on this became even more conspicuous. Spraying was discontinued after eight weekly applications, and the proportion of yields per plot was 5, 3, 2, between portions sprayed with one and a half ounces per gallon, one ounce per gallon, and unsprayed. It is clear therefore that Shirlan concentration at one and a half ounces per gallon controls the Cladosporium disease provided applications are made at weekly intervals, but as approximately 180 gallons of spray are estimated to be necessary for one acre at each application, the cost of this material will be almost prohibitive. Further experiments however, are planned for the coming season to test the possibilities of using this substance for the control of Leaf Mould disease, at a reduced cost.

35. *Irish Potatoes.*—While a certain amount of Late Blight also Early Blight was reported on this crop, damage from these diseases on the whole was not excessive. Mosaic and other virus diseases were not particularly noticeable.

36. *Tobacco.*—The main troubles reported in connection with this crop have as usual been the Mosaic diseases which have been reported on from time to time in other reports.

37. *Miscellaneous Crops.*—Powdery Mildew diseases of various sorts were conspicuous on beans, grapes, cucurbitaceous crops and many flowering plants during the late spring and early summer months Many other diseases of minor consequence have also been reported.

38. *Orchid Raising by the Asymbiotic Method*—This work is now at a standstill due to the demands on the Plant Pathologist's time for other work, but some of the original seedlings raised in 1938-29 are now showing signs of producing flowers.

Agricultural Development and Marketing Work.

39. This phase of the work has developed very considerably during the year due to the active interest displayed in it by the planters generally, and a large number of requisitions by planters both big and small to enter into the experimental work in testing the possibility of growing vegetables and many other minor crops for export. Plots were laid out in the irrigated plains of St. Andrew, irrigated land at Chapelton at an elevation of about 600 feet, at Grove Place in Manchester, and a number of other places to a lesser extent. The main trials in each case consisted of Eggplants and Sweet Peppers, and a number of varieties of each of these crops were brought under test in regard to yield and export qualities, and manurial tests were also made.

40. Without going into the greater details of this experiment in this report, it can be stated that in so far as Eggplants are concerned, the varieties Fort Myers Market and Florida Highbush, proved distinctly superior in almost every way out of a total of seven varieties brought under trial. It is true that some of the other varieties produced better looking fruit and in some cases a higher gross yield, but they showed tendencies of greater susceptibility to damage from insect pests and fungus diseases, and less resistance to damage arising during transport abroad. A number of tests were made with the long French Aubergine as this type of eggplant is in greater demand in the English market than the round American forms. Unfortunately, this type proved to be less adaptable to the tropical conditions of Jamaica. Generally speaking, the yields were hopelessly inadequate for commercial work. On account of the preference in England for this type of fruit, it is intended to make further trials of other varieties of long shaped eggplants. Preliminary tests were also made in budding eggplant on to the Susumber, a wild solanaceous plant which is frequently used by the East Indian population as a root stock on which to grow eggplants. While this

method of growing eggplants appears satisfactory for garden purposes, the indications are that it will not prove suitable in a commercial way. The test of the method on a field scale, however, is being planned for the coming season.

41. In the case of Sweet Peppers, it is quite evident that the one variety which is suitable for export both to England and to Canada is the "bullnose" type, known as "California Wonder." There is a distinct preference for this type in both markets and it produces fruit of outstanding weight and quality. The long types produce equally as heavy yields but the product is less attractive.

42. *Manuring of Eggplants and Peppers.*—Very little variation was observed in the manurial trials. General fertilizers of varying mixtures were used and on the whole it would appear that the effects of top dressings with nitrogenous manures are of the greatest benefit to the growth of the plant and the maintenance of a high quality of fruit production. In fact, unless both eggplants and peppers are adequately supplied with nitrogen the size of the fruit rapidly falls off. Empirical tests have shown very clearly that both eggplants and peppers, especially the latter, respond in an extraordinary way to two or three dressings of nitrogen fertilizer at monthly intervals from the time the first flowers begin to show and Nitro-chalk has proved to be the most satisfactory for this purpose. In fact, there are indications that this fertilizer assists the plant, especially the pepper, to maintain strong growth in spite of infection with the Root Knot Eelworm worm. Further tests, however, are necessary to confirm this point.

43. *Irish Potatoes.*—Preliminary tests were carried out in growing at different elevations, with and without irrigation, English and Canadian varieties of potatoes for export in the winter and early spring months, both to England and to Canada. The results of these trials will be included in a general report which will be prepared, covering the whole of the vegetable investigations during the period 1934-37.

44. *Beans.*—Further experimental trials were also made with beans, but the bulk of the crop was used for experiment in the Cold Store to find out the suitable type of package to allow of these beans arriving in the foreign market in a proper condition.

45. Small experiments with carrots, turnips, cauliflowers and sweet potatoes were continued.

46. Cold Storage trials continued although on account of the heavy demands for other work the full programme was not maintained. The three principal lines of investigation consisted of testing improved methods of precooling and preparing mangoes for export, the testing of the commercial value of the Highgate Banana as an exportable fruit and practical methods of preventing damage to eggplants by the fungus *Phomopsis vexans*. The mango trials have resulted in a greatly improved commercial result. The tests of the Highgate Banana revealed that it could be shipped fairly satisfactorily but needed considerably modified treatment to that required by the Gros Michel, especially in regard to the stage of maturity and methods of ripening. The eggplant trials have not yielded final results. All these experiments will be discussed in greater detail elsewhere.

47. The Cold Storage work also involved the test of several new crops for commercial purposes. Satisfactory methods of packing and precooling beans were evolved so that they could be exported to England on a 14-day voyage. Suitable methods of packing and precooling Vegetable Marrows, Passion Fruit, Tree Tomatoes and Naseberries were also discovered, while several vegetables also came under test.

Marketing Work.

48. The marketing work of the Division was considerably expanded during the period under review and regulations were brought into effect to compel all specified fruit and vegetables to be packed and exported through the Low Temperature Station or packing houses under its control. Altogether 17,229 packages of fruit and vegetables were exported through the Low Temperature Station, a very high proportion of which were grown by planters under the supervision of the officers attached to the Low Temperature Station. The attached table shows how these exports were divided between the various crops.

Summary of Fruits and Vegetables shipped from the Low Temperature Station for the season 1936.

Eggplants	1,780 crates
Peppers	1,036 "
Beans	324 "
Potatoes	311 "
Limes	9,123 "
Do.	376 barrels
Carrots	40 crates
Turnips	20 "
Oranges	240 "
Grapefruit	105 "
Tangerines, etc.	253 "
Tomatoes	334 "
Vegetable Marrows	21 "
Passion Fruit	149 "
Mangoes	2,133 "
Sweet Potatoes	3 "
Tree Tomatoes	34 "
Lemons	2 "
Miscellaneous	53 "
Highgate bananas	892 stems
	17,229

49. *Eggplants.*—These were mainly shipped to England but considerable quantities were also sent to Canada. The English shipments were made at temperatures of between 42 and 47 degrees which has proved most suitable for this vegetable. The fruit was wrapped and packed in crates measuring $1\frac{1}{4}$ cubic feet, with slatted sides, ends and tops. These creates have proved highly satisfactory for this class of vegetables

and contain approximately 18 lbs. nett weight with variations of 2 lbs. either way, according to size. Sizes ran from 8 to the crate to 42 to the crate, the favourite sizes being 18s, 24s and 36s. Prices varied between 4/- and 12/- per crate, according to the season of the year, demand, competition with Mediterranean crops and wastage due to *Phomopsis vexans*. Shipments were made to Canada in the standard American Pepper crate which contains approximately 1½ bushels. The Canadian market requires a somewhat larger eggplant than the English market and, therefore, in future plans it will be possible to divide shipments between England and Canada according to the sizes of the vegetables.

50. *Peppers (or Capsicum).*—Experimental shipments of this vegetable were also sent to Canada, but the bulk of the crop was shipped to the London market. Again, the Canadian market requires a larger and greener pepper than the English market and therefore shipments may be divided according to size. The English shipments were made in slatted crates which contained approximately 14 lbs. and measured exactly 1 cubic foot. It was found that it was unnecessary to wrap peppers either for England or for Canada although a tissue-paper liner through the crate proved desirable.

The Canadian shipments were made in the standard American pepper crate of 1½ bushels. Prices in England varied from 5/6 to 14/- per crate, according to quality, demand and season of the year. Canadian prices varied between $3.50 and $7.50 per crate, the latter price being obtained only during the Christmas week. This product carries extraordinarily well at almost any temperature between 42 and 50 degrees although at the higher temperature, especially towards the end of the season, it was found that a certain amount of ripening took place. Wastage in this product is practically unknown and only seems to occur when the peppers are harvested in wet weather or are seriously damaged mechanically during picking.

51. *Irish Potatoes.*—The varieties King Edward and Royal Kidney were grown experimentally for the production of "scraper" potatoes for the English market. Small quantities also of the Red Bliss Triumph, a round variety, and the Irish Cobbler were grown and harvested when still immature in the hope that they would be suitable for the English trade. It was found, however, that the two latter named varieties were totally unsuitable on account of their shape, and although they arrived in "scraping" condition, they sold at prices ranging from 2½d to 3d per lb., on account of the fact that there is a strong prejudice in the English market for kidney-shaped potatoes as new potatoes. The varieties King Edward and Royal Kidney were more satisfactory, especially the later crops which did not suffer at all from dry weather and produced perfect kidney-shaped tubers which sold as high as 7 d per lb. It was found, however, that dry weather tended not only to tighten the skins, thus making the potatoes less easy to scrape, but also appeared to influence the shape of the tubers and made even the kidney varieties develop abnormally into round shaped tubers. These potatoes were shipped mostly in flat crates holding 12 or 16 lbs. according to size and these proved a convenient sized package for the better class trade. In order that the tubers should not become dessicated, the crates were lined with a heavy waxed lining paper and this proved reasonably satisfactory. Experiments were also made with peat moss and while this proved expensive it did nevertheless retain the scraping condition in the tubers much better. In order to prevent discolouration of the flesh, it was found advisable not to use temperatures normally below 50 degrees.

52. *Vegetable Marrows.*—Small experiments were made of the Green Bush variety of Vegetable Marrow and while in some cases production was limited on account of Mosaic disease and other troubles, the plantings made at the higher elevations proved quite satisfactory. Fruit of a moderate size was shipped in crates holding about 6 to 8 fruit, measuring in all about 1½ cubic feet. The fruits were wrapped in paper and a little woodwool used to prevent bruising, the carrying temperature being between 42 and 47 degrees. Highly satisfactory results were obtained with these, and individual marrows were sold for prices as high as 1/3 each. The quality and condition were invariably well spoken of and further development of this product appears quite possible, especially in view of the fact that the crop is a cheap one to grow. Experimental shipments of the American varieties of Squash proved totally unsatisfactory both in England and in Canada.

53. Experimental shipments of small Carrots of the Watkins & Simpson's Special Early variety were made in bushel crates, the carrots being bunched complete with the tops in bunches of 12 to 18 roots. In order to preserve the fresh condition of the vegetable, however, especially the tops, it was found necessary to pack them in ice and to carry them at temperatures of approximately 32 to 33 degrees. With a few exceptions, these shipments arrived in a perfectly satisfactory condition and prices ranging from 10/- to 15/- per bushel crate were obtained in England. No shipments were made to Canada.

54. *Turnips.*—Experimental shipments of young turnips to the English market proved in every case to be a total failure on account of the green tops decomposing and arriving in a slimy condition.

55. *Passion Fruit.*—A considerable number of shipments of Passion Fruit were made to England with highly satisfactory results. They were packed in flat trays, measuring 17½ x 11 x 5 inches, and were shipped unwrapped but with the crates lined with tissue paper and woodwool was used to prevent bruising. Sales were made at prices ranging between 8/- and 12/- per crate.

56. *Tree Tomatoes.*—Small shipments of this fruit were made to England, packed in a similar manner to the Passion Fruit. The results in this case were also good and prices ranged from 6/- to 10/- per crate.

57. *Beans.*—A wide range of English varieties of the French Bean were tested in the experimental plots and shipments were made in a variety of packages to London. The earlier shipments proved unsatisfactory apparently on account of there being insufficient precooling and ventilation in the crate, but later shipments, as a result of experimental work in the Cold Store, proved far more satisfactory and ultimately the standard 6-basket tomato crate which is used in the United States of America was utilised for this product. It was found that the ordinary 4 American quart basket would hold 4 lbs. of beans and these were covered with sheets of punctured cellophane. It was found, however, that it was necessary to precool these beans before packing, and under such circumstances they carried extraordinarily well for the 14-days voyage to England, selling at prices ranging between 4d and 7d per lb. A considerably quantity of String Beans of the ordinary Red Pea variety were shipped to Curacao in 12 lb. crates and these beans stood up quite well to this method of packing for the short voyage to Curacao. Prices in this case were also satisfactory. It is intended to develop the Bean business on a larger scale during the coming season as it would appear that this product is considerably more profitable and involves far less capital than many of the other vegetables. Furthermore it can be grown as a catch crop between yams, bananas, sugar cane and

any other more permanent crops. It is essential, however, that the beans should be reaped three times per week in order that no fibre should be allowed to develop in them.

58. *Tomatoes.*—So far, this Division has not undertaken any serious part in the export of tomatoes as this has been carried on to some extent by private interests. It will, however, be a subject of further investigation later if it is found necessary. Small quantities were shipped to Canada in the standard 30-lb. lugs in the season and quite satisfactory prices were obtained. Freight and railroad charges, however, proved to absorb a considerable portion of the returns.

59. *Tangeloes and Tangerines.*—One or two shipments of the Ortanique Tangeloes, produced by Mr. C. P. Jackson, were made with highly satisfactory results, half-citrus crates being used as the package for the fruit. Small quantities of tangerines were also shipped to England.

60. *Mangoes.*—The mango export business was considerably developed during the year and shipments up to 450 cases per week were made to London, smaller quantities being sent to Canada. The early small shipments made to England during April and May realised prices of from 9/- to 12/- per dozen. The later heavy shipments naturally did not sell so well but they made it possible for this fruit to have a wider distribution and to be tasted by a number of members of the consuming public who had not had an opportunity to test it before. The heavier shipments realised prices of from 4/- to 7/- per dozen but in some cases where it was necessary to store the mangoes for any length of time, wastage took place due to the fruit becoming overripe. Some wastage also took place when the fruit was picked in wet weather. A proportion of one shipment was also lost but in spite of this and in spite of the fact that the Canadian shipments proved again to be a financial failure, the prices for the season, after all expenses including picking had been paid, averaged out at slightly under 2/- per dozen for the fruit "hanging on the tree." Some trouble is still experienced with this crop in shipping fruit which is immature. It is not always easy to tell when the fruit is just at the right stage to ship. If it is too near ripening, it ripens on the ship; if it is too green, it ripens but the flesh is sour and unpalatable. The shipping of some immature fruit was responsible for certain losses. Nevertheless, the considerable shipments made during the year indicate clearly that the Jamaica Pairi mango can be shipped in reasonable quantities at good, profitable prices, and further development of the trade is anticipated in the coming season. Experimental work in the Cold Store has clearly shown that the essential point to be observed in shipping mangoes is that of adequate precooling, provided, of course, that the fruit is in the right stage of maturity for shipment. Accordingly, all fruit has been precooled prior to packing for at least six hours at a temperature of approximately 50 degrees. It is then packed in the Cold Store in trays, measuring $17\frac{1}{2}''$ long by $11\frac{1}{2}''$ wide by 4 to $4\frac{1}{2}''$ deep. Each fruit is wrapped and packed with woodwool around it to prevent bruising and only in single layers. The removal of the heat from the fruit before it is packed plays an important part in the condition in which it arrives at the other end of the voyage.

61. *Limes.*—At the request of several lime growers and on account of the fact that there was a shortage of lemons in England, the export of limes was commenced in a small way in the Summer of 1935, and with the beginning of the full crop of limes in the Spring of 1936, this business was considerably developed The fruit was shipped to England in quarter-sized citrus crates specially constructed and printed in green with suitable advertising slogans. Satisfactory results were obtained in England up to the middle of September, prices ranging between 6/- and 10/- per crate. Thereafter, however, the market completely collapsed and it was difficult to move limes in any volume although shipments were continued with a view of endeavouring to make this fruit more popular. Considerable losses, however, were sustained from these shipments late in the year which offset the satisfactory prices obtained in the Spring and early Summer months. An advertising campaign was carried out on the London tube trains and buses, and while this undoubtedly had some effect upon the sales, it is clear that it will be a number of years before the general prejudice in favour of lemons can be overcome amongst any proportion of the English consuming public. It does seem possible, however, with adequate advertising, to develop some trade for this produce in England and we have to express gratitude to Messrs. T. J. Poupart, Ltd. and Selfridges and other London Stores who all did their utmost to assist in the popularising of this fruit. Further developments will be made in this business during the next season.

62. Experimental shipments of limes were also sent to Canada and those arriving up to the third week of August, were sold for satisfactory prices. With the beginning of the cold weather, however, the demand ceased almost completely. Experimental shipments were also made in barrels and in crates to New York, and there appears to be every prospect of improving and developing the Jamaica trade in this commodity in all three markets to which the fruit has been shipped. It is interesting to note that the English public demands a yellow lime, fully ripe, whereas the Canadian and American market require a green lime. This, of course, makes it possible to make use of the ripe limes which would otherwise have to be used in bye-products. While it is desirable to refrigerate this fruit during transport, temperatures should not be allowed to drop below 47 to 50 degrees.

63. A much wider range of products and considerable development in those products already established on the market is anticipated and planned for the coming year, and it is hoped that 50,000 or 60,000 packages will be shipped during the 1937 season.

Exhibitions.

64. The Low Temperature Station took charge of arranging exhibits of fruits and vegetables at the British Industries Fair in February, 1936, and at the Imperial Fruit Show, Liverpool, in October, 1936. These exhibits were arranged for by the Secretary of the West India Committee and were staged and exhibited and attended to by Mr. Ravenhill and members of the staff of Messrs. T. J. Poupart, Ltd. These exhibitions have proved extremely valuable in advertising Jamaica products and have assisted materially in the demand for fruits and vegetables which are being shipped to the English market.

Acknowledgments.

65. In concluding this Report, I desire to express my very sincere appreciation for the services which have been rendered to this work by Mr. D. Ravenhill of Messrs. T. J. Poupart, Ltd., London; Messrs. Mutual Brokers and Messrs. Drew, Brown Ltd. of Montreal; and to the California Avocado Growers Associa-

tion in the United States of America. All these companies have rendered very fine services in the development of the Jamaican trade, without which this marketing development work could not possibly have been brought to the satisfactory stage at which it has arrived.

66. I also desire to express sincere appreciation to those planters and the other person in Jamaica who have taken such intense interest in this work, especially to the members of the Advisory Committee on the Banana and Citrus Industries; to Mr. Harold Braham, the manager of the Jamaica Citrus Producers' Association, who has always from the inception of the Low Temperature Station, made his services and experience available in so many ways that it is impossible to define them all; to Mr. Alan Squire of the Jamaica Citrus Producers' Association for advice and assistance in many ways; to Mr. G. G. R. Sharp and to all those growers who have allowed us to use their properties for experimental plots; in particular I desire to mention Major Moxsy and Mr. S. W. Sharp.

F. E. V. Smith,
Plant Pathologist and Officer-in-charge,
Low Temperature Station.

Advisory Committee on the Banana and Citrus Industries.

The membership of the Committee remained unchanged for the year under review and consisted of the Honourable A. C. Barnes, Chairman, Messrs. D. T. Wint, G. A. Hawkins, H. Braham, G. G. R. Sharp, G. J. Goble, F. A. Cory, T. J. Cawley, K. V. Abendana, P. Lindo, M. O. V. Ffrench-Mullen and F. E. V. Smith, Plant Pathologist, Secretary.

Two meetings were held during the year and the principal subjects discussed were investigations and explorations in the far East to find a parasite for the Banana Borer, the banana breeding work and the leaf disease of bananas.

Apart from the two meetings which were held, however, a good deal of business was transacted by means of circulated papers.

A summary of the incidence of Panama Disease during the year under review is given as an appendix to this Report.

F. E. V. Smith,
Plant Pathologist and Secretary,
Advisory Committee on the Banana and Citrus Industries.

Incidence of Panama Disease in parishes other than Portland in 1936.

Parish.	Total Trees.	Total Plots.	New Cases.	Recurrences.
St. Thomas ..	25,253	22,550	38	22,512
St. Mary ..	362,675	327,318	3,566	323,752
St. Ann ..	22,226	19,427	45	19,382
Trelawny ..	4,594	3,175	19	3,156
St. James ..	61,799	41,617	128	14,489
Hanover ..	807	398	54	344
Westmoreland ..	2,306	1,931	91	1,840
St. Elizabeth ..	1,428	971	159	812
Manchester ..	4,419	904	82	822
Clarendon ..	39,294	8,888	180	8,708
St. Catherine ..	67,024	66,951	1,813	65,138
St. Andrew ..	4,616	4,616	219	4,616
Total for 1936 ..	596,441	498,746	6,394	492,352
Total 1935 ..	415,921	334,262	4,418	329,844
Total 1934 ..	229,170	154,178	4,271	149,907
Total 1933 ..	141,174	81,406	3,206	78,200
Total 1932 ..	121,722	65,495	3,371	62,124
Total 1912 to 1936 (Excluding Portland)	1,753,702	1,274,699	34,774	1,239,925

Monthly Totals.

Months.	Total Trees.	Total Plots.	New Cases.	Recurrences.
January ..	44,225	36,223	461	35,762
February ..	44,139	37,274	626	36,648
March ..	42,184	37,198	571	36,627
April	45,059	38,477	524	37,953
May	39,448	34,166	614	33,552
June	43,000	37,644	280	37,364
July	48,172	43,313	382	42,931
August ..	53,137	45,727	455	45,272
September ..	68,430	59,521	1,014	58,507
October ..	54,045	45,194	277	44,917
November ..	55,832	42,950	394	42,556
December ..	61,770	41,059	796	40,263
Grand Total ..	596,441	498,746	6,394	492,352

F. E. V. Smith.
Plant Pathologist and Secretary.

Report of the Agricultural Officer Inspecting of Imported Plants, Plant Products and Agricultural Machinery for 1936.

A. The inspection service was maintained without a break throughout the year.

The legislative position with regard to plant importation remained unchanged with the exception of two orders made by the Governor with a view to controlling the spread of gladiolus thrips in the Mandeville area. The position at the end of the year was that gladiolus corms could be imported into the area only from the United Kingdom.

B. Inspections of imported Fruits and Vegetables.

	Packages.
Passed for consumption in Jamaica	7,129
Passed for transhipment	286
Refused Entry	26
Destroyed	2
	7,443

The greater part of all fruit and vegetables imported was supplied by the United States of America, but both New Zealand and Canada sent appreciable quantities of apples. No commercial importations were made from Great Britain, though boxes of apples and pears were frequently brought by passengers. Although importation from the Bahamas is permitted, no importations were actually made from these Islands.

Pests and Diseases.

Apples and pears which form the bulk of the fruit imported, were usually quite free from pests Low grade apples were frequently found attacked by scab (Venturia inequalis) a disease which is not considered dangerous to the Island. On a few occasions the apples were found to be slightly infected with San Jose scale.

Soft fruits such as plums and peaches were frequently found to be heavily infested with lepidopterous borers, probably Peach twig borer. This caused frequent rejections during the summer months.

Aphids on lettuce caused some rejections.

Celery blight (*Septoria Apii*) was the cause of refusing entry of several boxes of celery.

Prohibited fruits such as bananas, oranges, mandarins, grapefruit and kumquats were found in baskets of fruit brought by passengers. These were refused entry.

C. Inspection of imported Plants.

	From the United Kingdom.	From other Countries.
Passed after fumigation and Inspection ..	171	175
Passed after additional treatment	27	14
Destroyed	3	37
Re-exported	..	1
	201	227
Total		428

Plants were imported from twenty-three countries, as follows: United Kingdom, United States, Colombia, Canada, Holland, India, Trinidad, Panama, Hong Kong, British and Spanish Honduras, Cayman Islands, Costa Rica, Japan, Papua, Siam, Straits Settlement, Porto Rica, Cuba, Bermuda, Barbados, Ceylon, British Guiana.

Pests and Diseases.

The following list shows the more important pests and diseases found on imported plants—

1. Scale insects on orchids from Trinidad.
2. Pycnidia of unidentified fungus on pomegranate from U.S.A.
3. Whitefly on Avocado trees from Spanish Honduras.
4. Termites in Orchids from Cayman Islands
5. Leafspot (Gnomoniopsis cincta Stoneman) on orchids from Cayman.
6. Aphids on gladioli from England.
7. Scale insects on orchids from India.
8. Scale insects on orchid from England (Twice).
9. Thrips on orchids from Trinidad.
10. Scale insects on orchids from U.S.A
11. Onion Smut on sets from U.S.A.
12. Mealy bugs on Gerbera from U.S.A.
13. Aphids on Gladioli from Canada.
14. Microlepidoptera in plant material from British Guiana.
15. Scale on orchid from Panama.
16. Egg cases of insect on plant material from China.
17. Scale on Orchids from Colombia.

On several occasions when insect pests were found the plants were examined and recommendations made by the Entomologist.

D. *Health Certificates issued.*—During the year 46 Certificates were issued covering shipments of plants and seeds to Curacao, Colombia, India, England, Virgin Islands, U.S.A., Bermuda, Tanganyika Federated Malay States, Portugese West Africa, Kenya, Panama, Cuba, Scotland, New Zealand, Bahamas, Haiti, Barbados.

Fifty-one Health Certificates were also issued for shipments of fruits and vegetables to England.

E. *Seed Potatoes.*—The table below shows the origin and number of packages of seed potatoes inspected during the year. The total shows an increase of more than 300% over the figure for 1935.

	Passed.	Condemned.	Total.
Canada	3,447	..	3,447
Scotland	1,337	311	1,648
England	2,400	..	2,400
Irish Free State	50	..	50
	7,234	311	7,545

311 bags in two shipments were condemned because of bacterial rot following Late Blight infection.

F. *Agricultural Machinery.*—Five lots of Agricultural machinery and tools, comprising 57 packages were dealt with during the year. Disinfection as carried out when required by permit or otherwise considered necessary.

G. *Miscellaneous.*—240 Canada balsams imported under permit for use as Christmas trees were examined and passed.

Four Mattresses from Panama were detained by the Customs. On inspection the stuffing was found to be cotton. The matter was referred to the Director of Agriculture who ruled that when such mattresses were the personal property of passengers, delivery should be permitted, but if imported for purposes of trade they should be accompanied by a certificate of disinfection.

Two lots of chairs from Haiti, totalling 193, were found to be padded with banana trash. Delivery was permitted after destruction of all trash by burning. One other lot of chairs was detained by the Customs but was later released when inspection showed that the padding did not contain any banana trash.

J. B. M. Ewen,
Agricultural Officer.

XIV—*Annual Report of the Entomologist for the year* 1936.

Director,

I have the honour to submit hereunder a Report on the activities of the Entomological Division during the period I have last year been in office, i.e. from the 1st of January until the 12th of March, and again since I resumed my duties on the 27th of October, until the 31st of December.

From the 12th of March until the 27th of October, the Botanist acted as Government Entomologist and the events of entomological interest which occurred during that period will be recorded in his Report. It is with much pleasure that I record here my gratitude to the Botanist and to the Technical Assistant in the Entomological Division for the very efficient manner in which routine and advisory work has been continued during my absence.

Whilst I was on leave in England, I attended a meeting convened by the Agricultural Advisor to the Colonial Office when the question of introducing into Jamaica predators of *Cosmopolities sordidus* from Fiji and from the Federated Malay States was discussed with Sir Guy Marshall and Mr. Simmonds, the Government Entomologist of Fiji.

The points which came under discussion at that conference and the recommendations made were subsequently submitted to Government.

Also whilst on leave, I had interviews with the Director of the Imperial Institute of Entomology with whom I discussed various entomological problems of interest to this island and his advice was obtained with regard to our project of introducing into Jamaica a parasite, (*Dasycscapus parvipennis*, Gahan) to control the Thrips which attack mango.

With regards to the Departmental objective of establishing biological control of insect pests, steps have also been taken to obtain from Trinidad consignments of the Coccinellid, *Cryptognatus nodiceps*, Mshl. for liberation in the Cayman Islands where coconut suffers intensely from the scale insect, *Aspidiotus destructor*, Sign.

During my stay in England I also visited the laboratories at Winches Farm, St. Albans and discussed the local aspect of the problems which we are investigating with reference to Nematodes attacking economic crops.

The question of *Cosmopolities sordidus*, Germ. as a potential, if not an active disseminating agent of Panama Disease was also discussed with Professor Ashby, who kindly offered suggestions with regards to the experiments I would like to carry out when an Insectary will have been erected near the Laboratory.

Pests which have received attention during the period I have been in Jamaica are recorded hereunder, under the crops which they affect.

Sugar Cane.—This crop, has, on the whole, continued to suffer but little from insect attack.

The new varieties under cultivation in the experimental plots have been kept under close observation with regards to the possibility of some of them showing susceptibility towards the Moth Borer, *Diatraea saccharalis* F.

The following figures give a summary of the data obtained by periodical surveys:—

Co. 281	9.1%	Nodal infestation.
Co. 213	6.5%	" "
P.O.J. 2725	3.0%	" "
Mexican Stripe	1.68%	" "
E.K.	1.6%	" "
F.C. 916	0.62%	" "
B/H. 10(12)	0.46%	" "

The varieties P.O.J. 2878 and 2714, S.C. 12/4, B. 11569, B. 726, B. 417 and M. 28 growing contiguously to the above were not found infested.

It will be noticed that though nodal infestation has remained very low in all varieties, Co. 281 and Co. 213 again showed the highest percentage of infestation (see Annual Report for 1935).

Citrus.—The incidence of pests attacking citrus trees in the different localities where important groves are being established, have continued to receive special attention.

Whilst, on account of more efficient methods of control, damages done by scale insects have, during recent years, been noticeably on the decrease, outbreaks of the Fiddler Beetle, *Prepodes vittatus*, (L) have in many instances been destructive.

Examination of the stomach contents of Toads captured in Citrus groves has shown that *Bufo marinus* feeds greedily on adult of 'Fiddler Beetles.' To demonstrate the useful role of those predators, it is now proposed to breed young toads in artificial pools and to liberate, during the seasons when the weevlls are abundant, reasonably large number of individuals in the Departmental citrus plantation at Grove Place where the pest has repeatedly caused noticeable damage.

Coffee.—An outbreak of the Coffee Stem Borer, *Apate* (*Amphericus*) *tetebrans*, Pall. occurred on a property in the Mavis Bank area where the pest was rapidly brought under control by measures of field sanitation and treatment of infested plants with paradichlorbenzene crystals inserted in the tunnels made by the pest.

Truck Crops.—Apart from localized outbreak of the more common pests, the following came under observation:

The Pentatomid, *Thyanta perditor* (F) attacking Pepper at Cockburn Pen where a large number of such fruits were disfigured by the mottling caused by the insect.

Nezara viridula (L) caused similar damage to garden eggs and pepper especially in Clarendon.

A severe infestation of *Lachnosterna jamaicensis*. Arrow, and *Ligyrus tumulosus*, Burm., attacking the root and crown of garden egg plants caused heavy losses at Cockburn Pen, where the adults are now regularly captured by light traps.

The Flea Beetle, *Epitrix parvula*, (F) was very destructive to young sweet pepper plants grown at Hope.

The Flea Beetle, *Disonycha laevigata* Jac., occurred on Beet at Kingston Pen.

The Lace-wing Bug, *Corythuca gossypii* (F). attacked garden egg plants and peppers at Kingston Pen; this pest has been specially abundant on Soushumber used as stock for budding garden eggs.

Thrips tabaci Linde. was destructive to onions at Kingston Pen.

Diabrotica themei, Baly, skeletonized the leaves of vegetable marrow in Clarendon.

Within a few days and before control measures could be applied several acres of pumpkin plantation at Spanish Town were completely defoliated by the caterpillars of *Margaronia hyalinata* (L). For several reasons insecticides poisonous to human could not be employed under the circumstances, but heavy dusting with slaked lime saved the rest of the plantations.

The Coreid, *Anasa scorbutica* (F.) which has proved very destructive to squash at Cockburn Pen and which is very difficult to control by means of insecticides were also found in numbers at Hope.

With the rapid expansion of production of vegetables for export, the great number of pests which attack such plants have continued to receive particular attention.

Tobacco.—The Leafhopper, *Dicyphus luridus*, Gibson., was abundant on the growing plants during the months of October and November, but did no economic damage.

Protoparce sexta jamaicensis, Kinly., has been the more serious pest attacking tobacco in the fields and the green leaves in curing barns.

The Vipionid Wasps, *Apantelas congregatus*, Say., and *Apanteles americanus*, Lep. and the Tachinid flies, *Atacta geminata*, Curr., and *Zenilla distincta*, Wied., which usually keep this pest under economic control were not found this year in the experimental plots at Hope. The survey made indicated that for next season it may be desirable to breed those particular parasistes in the laboratory for distribution in the areas where their presence will be needed.

The Green Bug, *Nezara viridula* (L) caused appreciable damage in the plots at Cherry Gardens.

Seedlings suffered little damage from *Solenopsis geminata* where the seed beds were treated with Jeyes-Kerosene Emulsion, whilst flea beetles were also generally kept under complete control.

In view of the development of tobacco cultivation the pests which affect that crop and particularly Eelworms, are the object of special investigations.

Miscellaneous.—The archives in the Island Record Office at Spanish Town were fumigated and the documents at the Colonial Secretary's Office and at the Government Savings Bank treated against insect attacks.

Dissemination of Information of Entomological Interest.

Routine identification of insect specimens sent in by the public and advice with regard to control on the field and garden scale of insect pests have been continued. Lectures and demonstrations have as usual been given at Agricultural Meetings.

Articles on the more outstanding entomological problems have been regularly published in the Journal of the Jamaica Agricultural Society, whilst a paper 'Insecticides to Control Insect Pests in Jamaica' has been published as a Departmental Bulletin.

W. H. Edwards,
30.3.37.

XV—*Report of the Agricultural Chemist.*

1. Soil Investigations.

Soils of the Cayman Islands.—A Report was made on certain soil samples from the Cayman Islands obtained by the Government Entomologist during his visit. The soils are all of limestone or coral origin They may be classified into three types, namely, Bluff formation soils, which are similar to the terra rossa of Jamaica, Ironshore soils which are comparable to the black coral derived soils of Jamaica, and Hurricane

Beach soils which are composed of old sand dunes. With the exception of the Hurricane Beach soils they show a relatively high nutrient status. The poor productivity of the soils can be ascribed to the low and irregular rainfall coupled with their low water-retaining capacity and their shallow nature. The Hurricane Beach soils were low in nutrient status. Recommendations were made for conserving moisture by the use of seaweed and vegetable mulches, of stone mulches and by the inclusion of as much organic matter in the soil as possible. Recommendations were also made for adding nutrient to the poorer soils by the use of local sources of manurial substances such as sea-bird guanos, fish guanos, and ashes of domestic household fires. There appears little reason why the islands should not be self-supporting with regard to manurial substances, with the possible exception of potash salts.

Soil Survey of Lower Clarendon.—A detailed survey of some 40 sq. miles representing the ancient flood plain of the Minho River is in progress. The soils of the upper part of the area are derived from the white limestone hills to the north and west. These soils vary from fairly recent terra rosa immediately below the hills to more mature deflocculated soils which have been washed further from the hills. The soils of limestone origin have been superimposed on older deposits which form the bulk of the plain. The original Minho River deposits are characterised by a purple tinge. They vary considerably in texture, but the greater proportion are sands, sandy loams or loams. Large areas of these Minho deposits to the north of the plain, have been covered at a later date, probably subsequently to the time when the Minho assumed approximately its present course, by a layer of pale yellow clay containing in most places small particles of white grit. The clay is believed to be of marine swamp origin and the evidence obtained in the present investigation has tended to corroborate this belief.

The line of demarkation between the clay deposit and exposure at the surface of the Minho deposits is irregular.

The soils are further disturbed by intrusions of 'Hayes beds,' a conglomorated gravely deposit which forms slight risings above the general level of the plain. These beds have given rise to a further type of soil. In other sections the underlying limestone outcrops to the surface.

The area is drained by numerous gullies. The gullies have had, however, only a very localised effect on the soils and have eroded their channels to a dept of 20 to 30 feet, occasionally exposing the underlying limestone.

The agricultural properties and value of the various types of soil differ widely.

Terra Rossa.—Of the soil samples submitted for examination or obtained at the request of planters, by the far the greatest number have been of the terra rossa type. These soils have hitherto been regarded as essentially pasture soils with small areas of coffee and pasture crops of pimento and citrus. A system of agriculture has been developed in the past few years which has enabled the production of good grade bananas, of cultivated citrus and of vegetables.

Physical examination shows that the soils contain a relatively large proportion of clay. They are very friable however, and behave under cultivation as loams. Their chief characteristics are their red colour and the absence of any marked difference in appearance between the surface layer and the sub-soil layers. Their friable condition provides an ideal medium for root growth. Analysis shows a high content of manganese, titanium, iron and aluminium oxides.

Chemical examination shows that the soils contain relatively small amounts of available nutrients.

The limestone areas on which these soils occur are naturally porus and most crops other than orchard crops have difficulty in enduring a period of drought of any considerable length.

The agricultural treatment of the soil has therefore evolved along two main lines, namely the conservation of moisture in the dry season, and the provision of adequate and suitable supplies of plant nutrients. The conservation of moisture has been attained by the use of vegetable mulch. Fortunately many of the areas in which these soils occur consist of small pockets or valleys containing deep soil, surrounded by limestone outcrops of rough rock which are wholly unsuited for cultivation. An ample supply of mulch may be maintained in such areas by judicious cutting of the woods on these outcrops. Due regard must be given to the manner in which the trees are cut so that they will re-sprout with the maximum of ease and provide the maximum amount of green material in as short a time as possible, and to spacing the areas and times of cutting so that sufficient time is allowed for the trees to re-grow before the cutting in any area is repeated.

In certain areas where cutting has been thoughtlessly and carelessly done, or where there is small ration of hillside to arable land, a shortage of mulch is arising which is likely to become more acute as larger areas of such soil are used.

There are two alternative methods of providing mulch. Firstly, leguminous crops can be grown and either partially cut back in the dry period or wholly cut back and used to form a light mulch. Secondly, highly vegetative crops could be grown side by side with the economic crops, during the wet period for use as a mulch supply in the dry period. Wynne grass and Guatemala grass have been suggested as mulch crops but it is believed that more suitable plants could be found.

The determination of the supply of nutrient required has been undertaken by commencing field experiments on these soils with bananas, potatoes and citrus.

The red soils have additional advantages in that the tillage required is a minimum particularly when mulch is used, and artificial drainage is seldom necessary. Cultivation costs are therefore at a minimum.

Denudation and Soil Erosion.—Denudation of hillsides is becoming an important factor in the progress of Jamaica and has been the subject of considerable study during the year.

The immediate effect of removing forest or heavy bush growth from hillsides and river catchments is to decrease the water-retaining capacity of the area and increase the rate at which water runs off the hillside. Rapid flooding or rivers with possible damage to areas below result and only a small proportion of the rainfall remains to percolate through the soil to be released into rivers during following dry periods. Denudation of hillside may have an effect on the ability of Jamaican agriculture to withstand drought.

Soil erosion is mainly the result of heavy rain falling on uncovered, loosened areas of soil. The finer particles which contain the greater proportion of available plant nutrient in the soil are most easily removed. The amount of nutrient lost from hillside soils subject to erosion by the washing away of the soil particles

may be considerably greater than that removed by the crop. Cultivated hillside land on which precautionary measures against soil erosion are not taken will therefore rapidly deteriorate in productivity.

The topography of Jamaica is such that cultivation of steep hillsides is imperative if a sufficiently large number of cultivators are to be accommodated in the island.

The area of land liable to erosion is great and preventative measures are being taken only in a few cases. It is apparent that unless immediate preventative measures are taken to control soil erosion the agricultural and economic prospects of Jamaica will be seriously affected. The population of the island is increasing rapidly while under present conditions the area of land which will produce crops economically is decreasing. A general lowering of the standard of living of the agriculturalist is inevitable.

Of more immediate effect is the damage and financial loss caused by cultivating land without due precaution on steep hillsides immediately above or below roads. Cutting a road into a hillside must tend to induce land slides. The chances of land sliding on to the road or breaking away from below it in heavy rain are greatly increased by loosening and tilling the soil and removing the vegetative cover on areas immediately above or below the road. It is estimated that at least half of the land slides and break-aways on the roads of the Island are preventable.

The following preventative methods against soil erosion are suggested after considerable study of the problems as they appear under local conditions. Firstly, when new hillside lands which are likely to be subject to erosion are opened up for cultivation, contour strips of natural bush be preserved at regular intervals on the slopes, cultivation being permitted only on the intermediate strips.

Secondly, crests of all main ridges should be retained in natural forest or bush.

Thirdly, the cultivation and thus the denudation of all rough limestone outcrops which carry a minimum of soil should be prohibited. Large areas of limestone hills are being denuded. The soil on such areas is always very shallow and frequently exists only in pockets. The trees growing on such areas are the product of many years growth. The soil is friable and easily washed away when the retaining influence of the tree roots is removed. New soil is formed very slowly from limestone rocks. Careless cultivation and cleaning followed by one or two crops which can be grown on such areas can displace the accumlated results of a thousand years. Such areas can become productive again only after many years.

Fourthly, the contour strip method of cultivation should be used. The small holder grows a variety of crops within a small area. Where hillside land liable to erosion is used, the erosion can be minimised by putting in the different crops in strips along the contour. Sugar cane planted in this way should prove a particularly good and efficient barrier to soil erosion. It provides a good cover to the soil during the greater part of the year; its root system is elaborate and has good soil holding power; and at the end of the dry season when many crops are clean cultivated and the soil is particularly liable to washing, the sugar cane is reaped and a thick covering of trash left behind to protect the soil. When permanent trees such as citrus are grown, they should be planted in rows along the contour.

Fifthly, the careful use of contour drains and of blind drains. Such drains are now in use in certain areas of Jamaica.

Sixthly, the use of cover crops were possible.

Seventhly, where forest land is cleared for short time crops and later abandoned, trees greater than a certain size should be lopped and not destroyed. Where the land is abandoned, such trees will sprout and form the basis of re-afforestation. At present the land is covered by a low grade bush which, while covering the land adequately, prevents the young forest trees establishing themselves.

Eightly, on loose steep hillsides, natural terraces should be formed where possible either by pegging the branches of trees along the contour, or by leaving small uncultivated areas. In areas such as the Blue Mountain area, such terraces will act as nuclei for recovering the land when it is abandoned.

A lecture on the subject of soil erosion was delivered at the Departmental Short Course held in July.

Land Settlement Survey.—The Agricultural Superintendent submits the following report:—

The Agricultural Superintendent has undertaken the survey of properties under consideration for the purposes of land Settlement. This officer is usually accompanied by a member of the Field Staff who is able to advise on the local conditions.

The report of the Agricultural Superintendent is based on the soil conditions present on the property. No property has been recommended for purchase except there has been every indication that the soils are capable of maintaining a permanent and not fugitive cultivation.

This emphasis on the necessity of the property having a soil of sufficient fertility and depth has resulted in unfavourable reports on certain properties.

In some cases the soil of areas examined had become infertile as a result of continuous cultivation or erosion, and was in a very poor condition. In certain properties over 80 per cent. of the land consisted of a thin covering of soil on a limestone formation. These soils are generally fertile for about two years or until the soil cover is exhausted or washed away leaving limestone rocks exposed. There is a strong demand by the small cultivator for this type of land as the immediate returns are impressive, but the rapid deterioration of such land cannot be considered as a desideratum for land settlement.

The old idea of a field or cultivation remote from the homestead is generally the basis for the demand for these second rate lands. The peasant cultivator has been in the habit of renting the inferior sections of the large properties, and has developed a technique for obtaining the largest possible returns for the minimum effort. The early exhaustion of these lands gives him no worry as he merely moves on to a new site. There is a grave danger of this process being paralleled in a Land Settlement Scheme, as the initial payment and subsequent moieties may be regarded in the same way as rent, and as soon as the land ceases to be productive it may be abandoned to the Government. Such land can only be of value to the Government again after a rest period of very many years.

There is no justification for the current idea that a small cultivator should be able to produce a crop from a soil which a big proprietor would not consider putting into cultivation. It appears that the converse of this should be true, and that the man with only five acres of land should have a better soil as he has no chance for selection.

It is appreciated that economic consideration would preclude the purchase of really first class properties, but no property has been recommended which does not contain a reasonable amount of good average land.

Soil Advisory Work.—An increasing number of applications from planters to have their soil examined, either because of crop failure or because of their intention to embark on a programme of artificial manuring, has been received. Where possible samples have been obtained and examined to such a manner that they will give information of the characteristics of the soil in that particular area. The large number of applications received has made it necessary to undertake more cursory examinations in many cases.

The samples of soil examined included the following:—

Samples of soils producing banana plants showing signs of scorching of the leaf edges and some leaf spot were submitted. Examination showed that the soil contained some amount of salt, but insufficient to account for the scorching. All soils, even those described as light loam, had a thin layer of compact clay in the subsoil, and the effect on leaves was largely attributed to this layer.

Samples of soil growing coconuts in poor condition showed slight exhaustion but no definite relation between soil factors and conditions.

The poor condition of coconuts in a certain area examined was attributed to plant starvation, the soil being very thin and overlying rock to a depth of only a few inches.

Samples examined from shale soil growing bananas contained only traces of available phosphoric acid.

An area of soil in the west of the island examined with regard to the capability of producing bananas or sugar cane was found to contain a high proportion of salt (sodium chloride).

Certain sugar cane estates have submitted samples of soil from each field about to be re-planted so that acidity and lime-requirement determinations may be made.

The soil of a school garden in which difficulty was found in growing plants was examined and recommendations for amelioration were submitted.

Samples of soil of yellow limestone origin obtained from good yielding and poor yielding areas of bananas were found to differ considerably in the content of available potash.

A number of pasture soils were examined with reference to their varying productivity of guinea grass. The poorly producing soils were chiefly on slopes from which the surface soil had been partially removed by erosion. On the steep slopes the use of alternative grasses was recommended and on the smaller gradients resuscitation of the areas by temporary use of leguminous green manures was suggested.

Areas of poor sugar cane soils were found to differ little chemically from the surrounding high producing soils. There were indications of a plastic surface soil and indifferent drainage in the poorer sections.

The demand for the services of the Division with regard to inspecting soil for report as to its suitability for certain crops has increased. A number of soils were examined to determine their suitability for vegetables and tobacco.

The total number of samples examined in the Laboratory during the year, including sugar samples was 1,376.

The number of soil reports issued to planters during the year was 19.

2. General Agricultural Analyses.

The general samples submitted for analysis may be classified as follows:—

Bat and organic manures	27
Mixed fertilisers	24
Marls and limestones	9
Waters (Irrigation)	35
Ashes (coconut and molasses)	8
Charcoals	5
Fodders	8
Cane juices and molasses	23
Miscellaneous	3
	142

The natural bat manures examined were with one exception, low in nitrogen content. A few had a relatively high content of phosphoric acid, but the majority were of little value. Many of the mixed fertilisers contained bat or bird guano as a base supplemented by the addition of artificial nitrogen in the form of sulphate of ammonia and of potash in the form of muriate or sulphate. The proportion of organic nitrogen in some of these mixtures was so small that they should not be termed organic manures.

The samples of marls and limestone submitted were of high quality. In most cases their agricultural value depended more on their degree of fineness rather than their content of calcium carbonate.

The ash from molasses burnt in specially designed furnaces contained a high proportion of potash. This method of utilizing waste molasses and at the same time supplementing the supplies of potash in the soil has been adopted by one sugar factory. The potash content in coconut ashes varied considerably with the mode of preparation.

The wide variety in salt content of the samples of water submitted showed that salt water unsuitable for use in irrigation may be found in all sections of the Island. Water which seems palatable may be sufficiently saline to interfere with the growth of many crops and particularly bananas.

3. Sugar Cane.

Statistical Work.—The publication of the Cane Field Survey Records for 1934-35 was delayed until the Agricultural Chemist assumed duty. The returns indicated that the general average yields of sugar cane in the Island was less in the 1934-35 period than the previous period. The decrease was due mainly to a lower and less equable rainfall. The decrease was less in the wetter western estates than the southerly and easterly estates. B.H. 10/12 and POJ 2878 retain their position as the best general purpose canes, the balance between the two being determined very largely by the incidence of mosaic disease. POJ. 2878 is producing a high yield in certain dry areas. Thirty-seven per cent. of the area returned is planted in B.H. 10/12 and 16.5 per cent in POJ. 2878.

The superiority of the seedling varieties is adequately demonstrated by the results of the survey. Unfortunately only in a very few cases are records available to enable the production to be judged on the basis of production of sugar per acre rather than production of canes per acre.

The figures demonstrate the increasing tendency to replant more frequently rather than using old ratoons and show that approximately one quarter of the cane area was replanted in the period under consideration.

The returns show that only about 60% of the area of sugar cane received artificial manure, but this proportion has probably increased considerably by the end of 1936.

Where possible, returns were obtained from cane farmers who are increasing in numbers as banana lands succumb to Panama Disease. Returns indicate that the average standard of cultivation of farmers is still below that of estates.

Factory Returns.—The collection of sugar factory returns were continued and weekly summaries were issued in addition to the monthly records. Further groups of factories have acquired chemists and the information circulated has thus become a more complete record of the relative performance of factories.

Sugar Advisory Committee.—One meeting of the Sugar Advisory Committee was held during the year. The work of the West Indian Sugar Cane Breeding Station in Barbados in relation to the requirements of Jamaica was discussed. A memorandum with regard to an Imperial Conference of Sugar Producers was considered. Recommendations with regard to the continuation of Factory Reports and to the calling of a Conference of Sugar Technologists were adopted.

Jamaican Association of Sugar Technologists.—A conference of Sugar Cane Technologists in Jamaica was arranged by the Department of Agriculture to discuss various problems incidental to the sugar industry and particularly with regard to adopting uniform methods in sugar factory control. At the conference it was decided to form a Jamaican Association of Sugar Cane Technologists. The Director of Agriculture was elected President of the Association and the Agricultural Chemist Hon. Secretary. An Executive Committee and a Chemical Control Sub-Committee were elected. The Rules for the Association have been drafted and persons who act in a technical capacity in the sugar industry have been invited to become members.

Field Experiments.—The results of the field experiments conducted over the period of 1933–35 have been compiled into a Departmental Bulletin. The results demonstrate particularly the potash deficiency in many of the inland basin soils, and in certain areas a phosphate deficiency. In drier irrigated areas the effect of the manure is related to the rainfall, and in such areas water supply may be more often a limiting factor to growth than nutrient supply. On alluvial soils complete manures are required, but insufficient work has been completed to determine the optimum amount.

A number of experiments are being continued, but no further manurial experiments were laid down during the year as the number of field staff available limits the total number of field experiments, both manurial and varietal, which can be reaped in the year.

No. of manurial experiments reaped	5
No. of manurial experiments continued in 1936 ..	4
No. of varietal experiments reaped	2
No. of varietal experiments planted	2

Two further variety trials have been commenced during the year utilizing chiefly the established varieties in order to eliminate from future work those which are the least satisfactory. F.C.916 and May.28 have been included in one experiment. In all cases B.H. 10/12 and P.O.J.2878 have given superior yields to those of any other variety.

The supervision of planting and reaping these experiments has been undertaken by Mr. M. S. Goodman, Superintendent of Cane Experiments.

4. Citrus.

Grove Place Manurial Experiment.—The final layout of the Citrus manurial experiment was decided following consultation with the officers of the Imperial College of Tropical Agriculture and the Trinidad Department of Agriculture. The area of the experiment is sixteen acres which has been divided into two sections. One section contains four randomised blocks each containing eight treatments which are designed to demonstrate the effect of excess or deficiency of one or more nutrients. The second section is laid out as a Latin Square and the treatments are arranged to show the most suitable nurtrient ratio to be applied to citrus in this area. The experiment is situated on typical terra rossa on which much of the citrus of Jamaica is grown. The first application of manure was given in September 1936.

Wakefield Pen Manurial Experiment.—An area of land has been acquired near Bog Walk on which as soon as plants are available, it is proposed to lay out a manurial experiment on lines similar to those of the experiment at Grove Place. The soil is typical of the area which is recognized as a satisfactory one for citrus. The area is now being cleaned and prepared for citrus planting.

Minor Manurial Trials.—The manurial trials which were commenced in 1936 have been continued. These trials are scattered through the parish of St. Mary and form part of the general citrus extension programme. The main objects are to obtain and maintain an interest in the use of artificial manure on citrus and to demonstrate the value of its use.

Maturity Tests.—A number of samples of citrus for maturity tests were submitted by arrangements with the Chief Produce Inspector. While in all cases the tests showed the relative condition of the fruit to be the same as it was selected, in two cases the fruit judged to be mature did not comply with the arbitrary

standard formulated under the test. There are indications that the standard required by the test may have to be lowered somewhat. The number of samples submitted was, however, insufficient for generalisations to be made.

5. Bananas.

Departmental Experiments.—The promise of an annual grant of money for three years by the three exporting companies has enabled a series of manurial experiments under direct Departmental control to be laid down.

The system hitherto used of laying down experiments on private estates has not proved altogether satisfactory. The Department has now acquired the lease of four areas of Hillside soils on which experiments have been placed. The areas have been selected on hillside soils for three reasons.

Firstly, the majority of small holders who are unable to undertake reliable trials for themselves occupy hillside areas.

Secondly, the area of alluvial land available for bananas is rapidly being reduced by Panana Disease and in a few years the areas remaining may be negligible.

Thirdly, the majority of alluvial lands in Jamaican estates for bananas being formed from a wide variety of soils, contain ample supplies of available phosphate and potash and are known to be deficient in nitrogen. The nitrogen requirements of bananas of such lands have been carefully studied. The hillside lands, being sedentary soils formed from one type of rock, show definite characteristics, and chemical determinations frequently indicate deficiencies in one or more of the chief plant nutrients.

Difficulty has been experienced in finding suitable hillside areas which have the necessary qualities and are available for leasing. The chief requirements are that the area shall be uniform, typical of the area or soil type, free from Panama Disease, contain a minimum number of coconuts, have moderate accessibility. Of the four experiments laid down, two are on the terra rossa soil type to which reference has been previously made in this report, one on the black shale soils (Richmond Beds) and one on the Bowden Bed formation. It is hoped if land is available to lay out two more, if possible one on Trappean Shales and one on Yellow limestone soils.

The experiment in St. James on the black shale soils has suffered severely from banana borer infestation and latterly from drought. The treatment consists of control plots receiving no manure, nitrogen treatment alone, nitrogen treatment supplemented by phosphate and potash treatment. The difference in the number of supplies required in the manured and unmanured plots is considerable and significant.

7.9 per cent. of supplies in manured plots (252 trees)
70 per cent. of supplies in unmanured plots (63 trees)
63 per cent. of supplies in unmanured guard rows (371 trees).

The plots are arranged in randomised blocks and the differences are statistically significant.

Growth records, periodic soil samples and crop records are being obtained from all experiments.

St. Mary Experiments.—The large scale experiments in St. Mary originally commenced in 1934 have since suffered two hurricanes and one severe drought sufficient to warrant cutting back the experiments. The severe conditions and the subsequent irregularities induced have masked any difference in effects of the various manurial treatments.

The manured plots as a whole have produced earlier and slightly heavier fruit than the unmanured plots. There is no apparent difference in grade production. The value of the early maturity was demonstrated at the time of the hurricane in 1935 when the following results were obtained.

Per cent. of total fruit reaped from manured plots	80.0
Per cent. of total fruit reaped from unmanured plots	72.6

The plots are arranged in a series of Latin squares. The differences are statistically significant only in some squares.

The experimental areas were seriously infected by Panama Disease. One root treatment was applied under the supervision of the estate management. A diagramatic record of disease occurence and spread has been kept over a period of three years. The results may be expressed as follows:—

No. of cases recorded May, 1935	5
No. of new cases May 1936	53
No. of new cases Nov. 1936	67
No. Contact cases round original 5 May to Nov. ..	51
No. Contact cases contagious with former cases 1936 ..	56
No. new cases (not contact) May to Nov. 1936 ..	11

These records show that of the 67 cases recorded between May and November 1936, 56 occurred in trees in direct contact with a former case. Only eleven new centres were formed and of those several are only separated by one tree from an infectious area.

Further cases are being recorded and plotted on diagrams.

The supervision and the recording of the results of these experiments has been undertaken by Mr. R. S. Martinez, Agricultural Superintendent.

Miscellaneous Banana Experiments.—Two small demonstration experiments have been commenced at Green Castle Estate. Three treatments each on 210 trees have been given. The main object of the experiment being to provide information with regard to experimental methods, to be used in the more elaborate experiments. The rate of growth of the treated trees is slightly in advance of the untreated trees.

A small experiment has been commenced on the old ratoons at Crawle Estate to replace the former one destroyed by hurricane in 1935. The selection of a treatment has been based on the apparent effects of the manures in the former experiment.

Several cases of considerable increase in banana productivity following a systematical manuring programme have been reported. The recommendations made by this Division for such programmes were based only on soil examination and were therefore, somewhat experimental. In most cases, the soil showed deficiency in available phosphate and applications of nitrogen and phosphoric acid were advised.

Cercospora Musae.—In view of the damage which had been done by the disease in the Central American Estates of the United Fruit Co. by Cercospora Musae, the Agricultural Chemist accompanied by the Microbiologist, paid a visit to the areas with the object of profiting by the experience gained by the officers of the United Fruit Co. with a view to treating the outbreak in Jamaica in the initial stages.

The various ecological factors which apparently influenced the incidence and rate of spread were studied. In Central America the only factor which seems to be related to the incidence of the disease in the texture of the soil. Bananas growing on lighter soils invariably were more heavily infested initially than those on heavier soils. The reason for this is not apparent and a secondary factor, a particular condition or texture of the leaf induced by the growth habit, may be the primary determining factor. Leaf condition is probably related to soil texture.

Suggestions that the incidence was related to nutrient deficiency, and to the pH value of the soil were examined, and it was concluded that it was extremely improbable that any such correlation existed.

The occurrence of leaf edge scorching in infected trees was noted. While many banana trees with leaf edge scorching are not affected with Cercospera, the leaf scorching is most in evidence on infected trees. The scorching has been attributed to potash deficiency, but the evidence in regard to Honduran soils is scanty. In Jamaica, leaf scorching has been observed mainly on soils poorly aerated, and on terra rossa soils which are low in nutrient status. Observations suggest that there is probability of a relationship between potash deficiency and leaf scorching in Jamaica.

Initial infection occurred on the edges of fields surrounding open spaces such as barrack areas, railway tracks and intervals.

A full report on the observations made during the visit has been submitted.

Certain instances of recovery from cercospora infection have been recorded. The damage to the tree by cercospera is due to the reduction in active leaf area, which if sufficiently great, will hinder filling of the fruit. The ripening process proceeds independently of the increase in size of the fruit and hence fruit is regarded as being prematurely ripe, i.e. ripe before they are full. If the cercospera infection is periodic depending on climatic factors, then by forcing the growth of the plant immediately after a period of infection, new leaves may be grown to replace the damaged ones with sufficient rapidity to prevent any permanent effect.

Conditions in Jamaica differ widely from those in banana areas of Central America. The conditions, in banana areas in Jamaica vary widely within small distances and except in the irrigated areas in the south these varying conditions offer obstacles to interrupt the rapid spread of infection.

The areas of severe infection in Jamaica may be classified into hillside and alluvial plain areas. The initial outbreaks on hillside areas occur on bananas growing on soils of poor nutrient status. The outbreaks occur chiefly on ridges, however, which were highly exposed. The exposure and nutrient status of the soil are inter-related in that normally the poorer soils occur on the crests of the ridges.

On the alluvial soils all the chief outbreaks have occured on soils derived mainly from purple conglomorate rocks. These soils are characterised by a tendency to pack and a low available potash content.

The pH values of a number of soil samples which were obtained from infected areas on alluvial soils were determined. The pH values ranged between pH 6.6 and 8.61. The majority of the samples from heavily infested areas were highly alkaline. Two outbreaks occured respectively on a highly acidic soil and a marl outcrop.

Determinations of sodium chloride were made on selected samples. The samples from one badly infected area contained considerable amounts of salt. In the remaining samples the content was normal. Samples were obtained to a depth of three feet.

6. Coconuts.

Two areas were examined, the object of the investigations being to determine if any relationship existed between the general conditions of the trees and soil factors.

The results of one area showed that there was no apparent relationship between the conditions of the trees and soil type or drainage conditions, but that all the soils tended to be low in potash content. Recommendations were made for trial manurial experiments.

In the second area the condition of the trees could be attributed entirely to lack of nutrient and to the shallowness of the soil. Conditions were such that it is doubtful if any treatment could be applied economically except in a few limited areas. Coconuts should not have been planted in the area.

7. Irish Potatoes.

A combined manurial and variety trial was conducted at Grove Place in co-operation with the Agricultural Superintendent. The soil at Grove Place is typical terra rossa and characteristic of a large area of soil considered to be among the most suitable for potato production. The yields of four varieties were compared. A fertiliser mixture was selected to determine the effect of manuring potatoes. The manure nearly doubled the yield of the more satisfactory varieties. The results of the experiments have been published.

A further manurial experiment has been laid down, using the highest yielding variety and comparing the effects on yield of varying the proportion of nitrogen, potash and phosphate in the original fertiliser mixture.

8. Tobacco.

In collaboration with the Tobacco Specialist a fertiliser mixture for use in the tobacco variety trials was recommended. The fertiliser, consisting of a mixture of 18.18 Nicifos and Sulphate of Potash to provide a ratio of 6.12.12, has proved successful on the areas now in cultivation.

It is proposed to conduct fertiliser trials using selected varieties to determine if the optimum ration differs for different soil types.

Samples of water used for watering tobacco seedlings which were suffering from wilt were found to contain a much higher proportion of organic matter than did the water used on a non-affected plot.

Samples of ash from waste leaves and stems were examined with a view to determining their value as artificial manure. The content of potash was about 25 per cent.

Tobacco plants grown with applications of potash as muriate and sulphate were analysed.

9. Pimento.

On the suggestion of the late Dr. Briton-Jones a number of selected diseased pimento trees were treated with artificial fertiliser mixtures of which potash salts were the basis. There was no apparent effect on the resistance of the trees to blight or on their recovering ability.

10. Fertilisers.

There has been a further considerable increase in the use of fertilisers during the year. The increased consumption is almost entirely absorbed by the extending use of fertilisers on bananas. Citrus has received a small proportion of the additional imports. The amount of fertiliser used on sugar cane has increased slightly, heavier applications being made particularly in irrigated areas.

The interest in fertiliser application has been accompanied by an increasing activity on the part of firms selling fertilisers. Active co-operation has been established between this Division and the major firms engaged in the distribution of fertilisers. Advise and suggestions with regard to fertiliser treatments have been invited by the representatives of these firms and have been given by the officers of the Division. This co-operation is of mutual benefit, and from the point of view of the Department ensures that the planters concerned are obtaining the maximum value from their purchases, within the limits of present knowledge.

11. General Advisory Work.

A number of visits to estates have been made with the object of advising on the manurial treatment of banana, citrus and sugar cane. Advice on such subjects has formed a considerable proportion of the advisory correspondence dealt with in the Division.

A large number of enquiries have been received concerning micro tests for available soil nutrients, and a number of sets for making these tests are now in use by firms and private persons.

Standard volumetric and indicator solutions have been supplied to sugar factories.

Recommendations were made for manurial treatments on the vegetable plots controlled by the Low Temperature Station although no detailed trials have been conducted.

Demonstrations of the use of the Zeiss Hand Refractometer have been given.

12. Publications, Lectures, Etc.

The following publications and special reports were made during the year:—

A Survey of The Yield of Sugar Cane in Jamaica, 1934-1935, Department Bulletin (New Series) No. 8.

An Experiment with Irish Potatoes (in collaboration with Mr. A. F. Thelwell, Agricultural Superintendent) Journal of the Jamaica Agricultural Society, September, 1936.

Coconut Ash as Fertiliser, abstract for Jamaica Agricultural Society's Journal, August, 1936.

Factory Performance in Jamaica in 1936, a report submitted to the Sugar Advisory Commitee.

A Report on a Visit to Central America.

A Report on Soil Samples from the Cayman Islands.

The July half-yearly meeting of the Agricultural Society was attended.

A lecture on Soil Erosion was delivered at the Departmental Short Course.

The Agricultural Chemist acted as Secretary to the Jamaica Banana Commission from the 1st January to the 31st May, 1936.

The Agricultural Chemist acted as Assistant Examiner in Practical Chemistry in the Cambridge Senior and Junior Examinations.

Mr. R. S. Martinez, Agricultural Superintedent was absent from the Island on leave from May until November.

XVI.—*Report of the Government Botanist.*

I have the honour to submit hereunder my Report for the year ending December 31st, 1936.

1. Introduction.

During the year under review I acted as Government Entomologist from March 12th to October 27th, besides fulfilling the duties of my substantive post.

The aim of the banana breeding programme being undertaken by the Department is the raising of seedling varieties of bananas commercially immune to Panama Disease (*Fusarium oxysporum* Schl., syn. *F. cubense* E.F. Smith) which will be acceptable to the overseas markets. Economic therapeutic measures of plant pathology have proven ineffective in preventing the steady spread of the Panama Disease pathogen through the better banana soils of the country, and it is hoped that through this work, seedling bananas suitable for replacing Gros Michel cultivation in land abandoned on account of disease, will eventually be forthcoming. While the work has only been in progress for what is from the plant breeding point of view a very short period, results are encouraging. During the past year seedlings have been raised with indica-

tions of a definite improvement in regard to their commercial characteristics on any which have been produced hitherto, and with the availability of a more promising wild parent, every effort to obtain which is being made, the final aim of the work should prove attainable.

In general the programme of breeding work undertaken and reported upon for previous years has been followed in 1936; in the light of recently collected data however it has become advisable to widen the genetic scope of the work and to discontinue work along certain lines. Cytological investigations have closely followed up the breeding work and continue to reveal data leading to economy of effort by the determination of the most profitable directions for breeding.

Weather conditions proved more favourable during 1936 for the production of viable seed than in the previous year, but the number of seed produced did not reach the high figure obtained in 1934. The destructive effect of the high winds of September and October, 1935 is reflected in the lack of pollinable fruit at Castleton and Orange Hill in the early months of 1936, these two plots did not in fact resume shooting normally until the end of May, recovery being considerably delayed by drought. During 1936, itself relatively little damage by wind was suffered by the breeding plots. A few pollinated stems were blown down on most of the plots, particularly at Orange Hill, Crawle and Coleraine, in the first case however, some of the losses are attributable to larceny.

2. Banana Breeding.

(i) *General.*—The value of carrying out the breeding work at a number of small plots located as far apart as possible is borne out by the fact that it was possible to continue breeding after the winds of September—October, 1935, in three localities, although in two, at Castleton and Orange Hill, a cessation of pollinations for several months ensued.

A summary of the pollinations etc., is included below in Table I. The entries opposite each year comprise figures computed from January 1st to December 31st., and in consequence each entry under 'Seed obtained' includes seed from pollinations of the previous year. The next column involves a further lag, as many seed planted towards the end of the year germinated in the following period. The final column enumerates only those seedlings which had been planted out in the field (many of which germinated in the previous year). At the end of 1936 there were still over 100 young seedlings in seed boxes and pots.

Table I.

Year.	Stems Pollinated.	Seed Obtained.	Seed Germinated.	Seedlings Established.
Prior to 1932 ..	..	..	..	49
1932 ..	1,379	103	13	3
1933 ..	401	6	1	0
1934 ..	1,472	650	56	1
1935 ..	1,957	896	253	89
1936 ..	2,260	784	191	173
		Total ..		315

The effect of the winds in the autumn of 1935 is reflected in the 1936 figures. The loss of 400 pollinated stems at that time is responsible for the fall in seed yield; and the lack of those seed early in the year for the fall in the germination count. In spite however, of the lack of pollinable fruit in the early months a considerable increase in 'stems pollinated' was achieved and this should be reflected in the 1937 returns.

The figures given in Table I. have been adjusted in Table II. so that the entries opposite each year represent the actual returns from the stems pollinated; thus, for example, of the 1,408 stems pollinated in 1934, 184 were fertile and yielded 911 seed, though many of these stems were not harvested until well into 1935. In reference to 1936 the 774 stems which remain to be reaped should yield well over 300 seed.

Table II.

Year.	Stems Pollinated.	Lost.	Reaped.	Fertile.	Percentage Fertile.	No. of Seed.	Seed per fertile Stem.
1933 ..	401	68	333	32	9.697	104	3.250
1934 ..	1,472	64	1,408	184	13.070	911	4.951
1935 ..	1,957	418	1,539	158	10.266	616	3.899
1936 ..	2,260	116	1,370	163	11.898	705	4.325

No further plots in new districts were laid down during the year (though one came into operation); extensions of the work at several of the existing plots were made. At the moment breeding is being carried out at six distinct centres; at Castleton, Coleraine (near Annotto Bay), Crawle (St. Mary), Grantham (Clarendon), Potosi (St. Thomas), and Hope.

Castleton, at an altitude of 430 feet above sea level, is located in a narrow valley approximately 15 miles north of Kingston. This plot at which breeding work has been carried out for the last ten years continues to prove the most satisfactory as regards seed production. The crosses carried out here consist principally in the raising of F1 hybrids from the 'Jamaica' banana (including 'Gros Michel', 'Highgate' and other sub-varieties) as the female parent, using pollen from various clones of *Musa acuminata* Colla.

Pollinations are carried out by hand under controlled conditions, both the male and female flowers being protected by bags from visiting insects. Encroachment of Panama Disease within the breeding plots here has recently necessitated their re-establishment on new soil. A ¾-acre plot, planted on the hillside above the Gardens in February, 1935, came into bearing about April, 1936; a 1-acre plot established at Gibbs Hill in St. Mary (about 1 mile from Castleton) in December, 1935, was just fruiting at the end of 1936 and pollinations are being carried out at both these plots. At Tom's River, about two miles from Castleton Gardens, an acre plot was planted with 'Highgate' in June and will be brought into the breeding programme in 1937. Tom's River promises to be a favourable breeding locality, for, of 11 stems of 'Gros Michel' which were pollinated here, 6 were reaped before the end of the year and 4 of them yielded 16 seed. At Gibbs Hill the Highgate variety is being crossed with *M. acuminata* Clone A, and at Tom's River the male parent will be another clone, B, of the same species. A new wild male parent, 'Samoa' has been planted at Gibbs Hill for use next year.

The plots in this locality amount in all to a total of about 4 acres.

Coleraine.—The plots in this district in St. Mary are situated at approximately sea level. At Coleraine estate itself F2 seedlings are being raised by crossing within and between the seedling varieties S.7, S.17 and S.19. Other seedlings showing features of commercial value such as S.95 and S.118 are also being used. In the first two months of the year one acre of S.19 which is suppling fruit for cold storage and shipping experiments was temporarily included among the breeding plots to replace the plants lost elsewhere from wind. This acre was however, no longer pollinated when the 2-acre breeding plot came back into bearing. The yield of seed from these plots is good. At Orange Hill, about two miles from Coleraine, the backcross to the female parent is being carried out (Gos Michel x S.19) on a three-acre plot. This plot suffered severely from the 1935 blows and pollinations were not recommenced here until the end of May. The same backcross has in the past been carried out on a one-acre plot in the vicinity, at Agualta Vale, but work was discontinued here in March as an adequacy of material was available at Orange Hill. At both these plots the yield of seed is very poor (See Table III below), this is however to be expected as F1 pollen is relatively infertile as compared with that from the diploid parent (c.f. Castleton). On both these plots pollination is controlled by bagging both male and female flowers.

Crawle is situated at an altitude of 1075 feet in the hills of St. Mary. The plots are located in three separate fields and total about 5 acres. The crosses being carried out duplicate those at Coleraine and Orange Hill. On three acres the backcross to the female parent, and on the remaining two, raising F2 seedlings form the programme. The yield of seed here is low but this is to some extent offset by the fact that this seed gives a considerably higher percentage germination than that from other comparable plots. No alterations or additions have been made to these plots during the year. Again, all flowers on these plots are bagged.

Grantham is situated at an altitude of 1,150 feet in the parish of Clarendon, and the plot is at present approximately one acre in extent. This plot provides a good yield of seed and is less affected by minor climatic variations so that a steadier supply of seed is obtained than from other plots. The cross at present carried out is Gros Michel x *M. acuminata* clone A, and as the male parent in use is the only variety producing viable pollen within many miles of the plot, neither flowers are bagged. It is proposed to extend the breeding work here in the near future and for this purpose about ⅔ acre of 'Highgate' were planted in June, together with a small plot of an undescribed wild species from India, namely, 'Calcutta 4', for the male parent. This cross will come into the 1937 programme.

Potosi.—A small plot of *M. sapientum* var. brachycarpa, which was planted early in 1935, flowered in March, 1936, and the pollen has since been used on 'Gros Michel'. The flowers are not bagged as *M. sapientum* provides the only viable pollen in the vicinity. The return of seed is disappointing and only one seedling has so far been raised from this cross. It will however, be tried out for at least another year. The same cross is being tried on a smaller scale both at Castleton and Orange Hill, but no seed have been obtained from these plots so far. *M. sapientum* is less closely related to 'Gros Michel' than *M. acuminata* but has a much more vigorous habit and larger bunch than that latter species.

Hope.—The plot at Hope has been extended by approximately one acre during the year, but of this only one-quarter is used for breeding. The plot is maintained as a nursery for new seedlings, as a reserve of wild types used in breeding and for bulking up seedling and other varieties. The only breeding in progress here is the backcross of various seedlings to *M. acuminata* (Clone A) to provide an index of fertility of seedling pollen and material for determining chromosome behaviour at microsporogenesis in the seedlings.

A summary of the work during the year at the above plots is given below in Table III. The first four colums refer to numbers of stems of fruit and the last two to the corresponding numbers of seed.

TABLE III.

Plot Summary 1936.

Plot.	Stems Pollinated.	Lost.	Reaped.	Fertile.	Seed Yield.	Germinated.
Castleton ..	234	21	125	31	82	17
Tom's River ..	11	0	6	4	16	..
Coleraine ..	429	31	329	63	435	88
Agualta Vale ..	17	0	17	0	0	..
Orange Hill ..	309	21	117	2	2	..
Crawle ..	581	23	395	9	49	10
Grantham ..	330	6	212	48	116	19
Potosi	269	14	168	5	5	..
Hope ..	80	0	1	1	..	..
Total	2,260	116	1,370	163	705	134

(ii) *Breeding Lines.*—Crosses in operation during 1935 have been continued during the year under review. They consist in raising an F1 generation from the parents Gros Michel x *M. acuminata*, backcrossing F1 plants to the female parent Gros Michel and raising F2 seedlings from S.7, S.17 and S.19.

Three clones of *M. acuminata*, A, B and E are now in use in the original cross and Clone A promises to produce more vigorous seedlings than Clone B which has, in the past, been the more used. In addition, a new series of crosses has been commenced with *M. sapientum* var. *brachycarpa* which is being crossed with 'Gros Michel.' Both of these diploid wild species are immune from Panama Disease. The various crosses carried out during the year are summarised below in Table IV. Figures in the last column refer to stems pollinated in 1935, but reaped this year; other figures are all pertinent to the year under review

TABLE IV.

Summary of Pollinations, 1936.

Cross	Stems Pollinated.	Stems Lost.	Stems Reaped.	Fertile Stems.	Seed Obtained 1936.	Seed Obtained 1935.
*J x M. acum. A ..	330	6	212	48	116	17
J x " B ..	201	13	111	32	93	3
J x " E ..	29	2	23	3	5	..
J x M. sap. brach. ..	281	14	168	5	5	..
J x F1	654	39	356	2	2	..
F1 x F1	623	30	458	69	476	59
Sundry	142	12	42	4	8	..
Total ..	2,260	116	1,370	163	705	..
Pollinated in 1935	..	..	102	17	..	79
	..	..	1,472	180	784	

*J. (Jamaica) refers to the type variety Gros Michel (G. M.) together with its sub-varieties Highgate (H), Pink Jamaica (PJ), Plantain Jamaica (Plt J), Weeping Jamaica (W. J), Glengoffe (GG), and Free Hill (FH), all of which are triploid.

These figures exhibit a very close similarity to the corresponding ones for the past two years; the sole exception is seen in the marked falling off in seed yield from the backcross. There appears to be no obvious explanation of this, but it may possibly be related to the after effects of wind damage sustained by the plot at Orange Hill.

The backcross was initiated with the object of improving the fruit characteristics of the F1 seedlings, but from 2,300 pollinations carried out over four years only four seedlings have been raised, and though none of these have yet shot, little can be expected from them. Furthermore, for cytological reasons, (see below) it will probably prove impracticable to raise further generations of backcrosses to the female parent.

Of the F2 seedlings raised from such crosses as S.7 x S.19 and S.19 x S.19 few have yet fruited, but of those few several show sufficient promise to justify the continuance of this line of work. Most promise is however, shown by the seedlings from the original cross, J. x *M. acuminata* vars., and it is on this that future work will be mainly concentrated. Three clones of *M. acuminata* are in use as male parents in this cross on the females, 'Gros Michel' and 'Highgate.' Seedlings from 'Highgate' are superior to those of 'Gros Michel' in several characteristics. Insufficient data is yet available to assess the value of *M. sapientum* var. *brachycarpa* as a male parent. During the next year breeding with the two new male parents, 'Samoa' and 'Calcutta 4' will be commenced. In brief, results suggest that the future of this work lies chiefly in the F1 generation and that a wider range of immune wild species should be employed. With the co-operation of the Imperial College of Tropical Agriculture, Trinidad, efforts are now being concentrated on increasing the collection of such species with that end in view.

(iii) *Germination.*—During the past year 191 seed have germinated, and 24 young seedlings have died in the early stages of growth. 173 new seedlings have been planted out in the field of which 82 arose from the present year's germinations, 69 young seedlings remaining in the greenhouse, the remainder, 16, having been discarded.

The percentage germination of seed during the year averaged 19.0% as compared with 22.5% for 1935 and 12.0% for 1934.

(iv) *New Seedlings.*—The new seedlings totalling 173 which have been established in the field are derived as follows:

Jamaica x *M. acuminata*		F2.		F2 *contd.*	
GM x Clone A ..	29	S.7 x S.7	8	S.20 x S.19 ..	3
PJ x " B ..	5	x S.19	12	x S.7 ..	8
H x " B ..	26	x S.20	2	S.40 x S.7 ..	2
FH x " B ..	1	S.17 x S.17	2	S.39 x S.19 ..	1
GG x " B ..	1	x S.19	3	S. x S.7 ..	2
		S.19 x S.19	23	x S.19 ..	22
Backcross		x S.17	2	x S.40 ..	1
GM x S.19 ..	4	x S.7	1	S.95 x S.29 ..	1
S. 5 x Clone B ..	12	x S.20	1		
S.7 x " B ..	1			Total	173

Including seedlings established in 1935 there are now growing:—

F1	J. x M. *acuminata* ..	102
Backcross	J. x F1.	4
F2	F1. x F1.	133
Sundry	.. ..	21
		260

Of the 1936 seedlings 11 had already shot by the end of the year, but none show particular promise Of the 1935 seedlings, the first shot on March 26th, since when 61 have fruited and 36 been harvested. This seedling fruit exhibits a great range of variability in many characters, particularly in regard to grade and weight and it will prove advisable to discard many before they reach the ratoon stage. On the other hand several show sufficient promise to justify bulking for further trial whilst a few promise in many ways to be an improvement on the best of our earlier seedlings such as S.19. The F1 seedlings generally show more promise than the F2 as may be seen from the following figures, (representing numbers of seedlings):

	Shot.	Reaped.	To be discarded.	Further Trial.	Promising.
F1.—*generation*:					
G.M. M.acum. Clone A	2	1	..	2	2
x " " B	2	2	..	2	1
P.J. x " " B	7	7	..	7	4
H. x " " B	4	2	..	4	3
F2.—*generation*:					
S.7 x S.7 ..	10	9	10	..	..
x S.19 ..	3	0	2	1	..
S.19 x S.19 ..	3	3	2	1	..
S.20 x S.7 ..	8	3	8	..	..
S.— x S.19 ..	3	..	3	..	..
S.40 x S.7 ..	1	1	..	1	..
Sundry ..	3	3	3	..	..
Misc. crosses ..	15	5	15	..	..

Regarded as promising are only those seedlings which in their vegetative growth and plant stems show a definite improvement from the commercial point of view over the best of our earlier seedlings. Of the F1 hybrids those from the crosses GM. and PJ. by *M. acuminata* show a marked resemblance to the earlier seedlings S.7, S.17 and S.19, etc., and only further trials can determine whether any will prove superior; several in fact suffer from the same serious defects in their vegetative habit, as for example, weakness of petiole.

The 'Highgate' derivatives are characteristic; like the female parent they are short in stature, carry short strong petioles and compact stem of fruit. The three best seedlings from this cross bore plant fruit as follows:—J.163, 8 hands weighing 30 lbs.; J.208, 8 hands weighing 35 lbs.; and J.202, 10 hands weighing 63 lbs. It should be borne in mind that these plants were grown principally for suckers and were therefore unpruned, which must tend to reduce fruit size. Though none of the F2 seedlings tabulated above show any marked promise their numbers are still too few to form a basis of estimating the value of this cross; their great variability will necessitate raising large progenies.

The two seedlings S.95 and S.118 which were noted last year as showing promise, have failed to exhibit any marked improvement on S.19.

(v) *Plant Introduction.*—No importation of new varieties for breeding has been made during the year 1936. New varieties introduced two years ago have generally grown well and the wild types 'Calcutta 4' and 'Samoa', as mentioned above, will shortly be incorporated in the breeding programme. Fruit from the Trinidad variety, 'Giant Governor' will soon be available in sufficient quantity for carrying out small storage trials.

Search throughout the country for variant forms of the 'Gros Michel' is being continued by the field staff to whom I am indebted for their co-operation. Of the five plants under observation at the end of last year, one has proved to be a minor variant of the 'Gros Michel' differing from the type in the almost complete lack of red pigment in the female and male bracts which are greenish yellow in colour. This variety, which has been named the 'Atkinson' banana after its discoverer, Mr. G. V. Atkinson of the Jamaica Agricultural Society, unfortunately, like its prototype, is susceptible to Panama Disease. Several plants which were reported from diffrent districts as possible new varieties, proved on inspection, to be Lacatan.

3. Musa Cytology.

Counts of the somatic chromosomes of the seedlings raised have been continued during the past year and have both confirmed those previously reported and thrown new light on the possibilities of banana breeding generally. 322 cytological fixations have been made and 232 seedlings counted, approximately 84 remaining to be dealt with. These counts are listed below:

Cross	2n.	No. of Seedlings.	Cross.	2n.	No. of Seedlings.
F1 GM x M.acum./A	38	1	F2. S.7 x S.7	44	8
	42	2		45	2
	44	22	S.7 x S.19	43	1
	77	1		44	6
x M. acum./B	44	1	S.19 x S.7	44	1
	77	1	S.17 x S.19	43	3

Cross.	2n.	No. of Seedlings.	Cross.	2n.	No. of Seedlings.
H x " /B	22	1	S.19 x S.17	44	1
	44	22	S.19 x S.19	22	1
	77	1		42	1
P.J. x " /B	44	12		43	1
	72	2		44	3
	73	1		45	1
	74	1	S.19 x S.20	44	1
	75	1	S.20 x S.20	44	1
	77	3	S.20 x S.19	43	1
WJ x " /B	23	1		44	2
GG x " /B	44	1	S.20 x S.7	43	1
FH x " /B	44	1		44	10
H x Robusta	44	1	S.39 x S.19	44	1
			S.40 x S. 7	44	1
Backcrosses.			S.17 x S.17	43	1
FH x S.7	55	1		44	1
GM x S.19	43	1	S.17 x S.20	44	1
	44	1	S– x S.19	42	1
	48	1		43	1
	53	1		44	17
			S– x S.40	44	1
S.7 x M.acum/B	33	5			
S.5 " /B	33	12			

In summary, the distribution of chromosome counts among 145 seedlings of the two main families is as follows:—

Chr. No. 2n.	22	23	38	42	43	44	45	72	73	74	75	77
Jamaica x M. acuminata 2n =33×2n =22	1	1	1	2	..	59	..	2	1	1	1	6
F1 x F1 2n =44×2n =44	1	..	..	2	9	55	3	..	..	..	..	..

These results closely bear out conclusions deduced from the work reported on last year which will not therefore be reiterated here. It should be pointed out however, that the backcross to the female parents tends to produce pentaploid seedlings as was expected. These, in addition to possessing an unsatisfactory phenotype, will prove highly sterile. The hope of breeding an improved fruit type by backcrossing to the 'Gros Michel' appears therefore slender. It is proposed soon to publish the results of this work in full detail elsewhere.

Preliminary experiments have been carried out to elucidate the optimum condition for the germination of Musa pollen by germination on artificial media. The results promise to supply valuable information both on the relation of the environment to pollen germination and the variation of viability of pollen from hybrids of differing chromosome constitution. This work will be reported in detail elsewhere when completed.

4. Banana Variety Trials.

(i) *Economic.*—No new variety trials have been laid down during the year under review. The plots of S.7, S.17, and S.19 planted in 1933 and 1934, which provide a supply of fruit for cold storage and shipping experiments have been maintained.

Owing however, to the small size of the samples of seedling fruit available for these experiments in the past, the S.19 plot at Coleraine has been increased in size from one to three acres, and it is planned to set up three new one-acre plots in ecologically distinct districts. Together these plots should afford an adequate supply of seedling fruit for experimentation towards the end of 1937.

The Caymanas plot in which these seedlings are grown under irrigation cannot be regarded as a success The fruit continues to grade well below 50% counts and shows no promise of improvement in subsequent ratoons. (C.f. Report for 1934).

A small consignment of S.19 suckers was sent to Fiji in September for trial as a commercial banana in that country.

The newer seedlings discussed above are still in the earliest stages of bulking, and will not be available in sufficient quantity for inclusion in variety trials for some time yet. The present procedure is to plant out new seedlings in the nursery plot at Hope where they are grown under constant supervision. The stools are not pruned and are allowed to shoot one stem. When these are reaped the seedling is dug out and the five to ten suckers which have developed are transferred to Coleraine to test resistance to Panama Disease. This initial method of bulking is prefereable to the alternative of removing suckers from the growing stool as they are developed, which, due to the continual disturbance of the root system, has a considerable retarding effect on growth.

Cold storage experiments with the Cavendish variety having been completed, the Cavendish plots at Glengoffe, Borobridge, Latiam and Hope comprising 3½ acres have been abandoned. A supply of material is still maintained however at Nonsuch (2½ acres) and Coleraine (2 acres).

(ii) *Panama Disease Tests.*—The procedure in the past in testing the reaction of new seedlings to infection by *Fusarium oxysporum* Schl., the Panama Disease pathogen, has been simply to plant the seedling for test on land known to be heavily infected with the disease. Only in special cases have the seedlings been planted actually in holes from which diseased plants have been removed. As a 100% distribution of the pathogen (even in heavily infected fields) is rare, the risk of avoidance of infection is obvious. As a

case in point, two seedlings, S.79 (J x S.7) and S. 102 (S. 5 x R) which from previous tests had hitherto been regarded as immune, have recently been planted in infected holes and gone down with disease. In future it is proposed to plant all seedlings to be so tested in holes from which diseased plants have been removed With this object in view 2 acres of heavily infected land were planted with 'Gros Michel' on September 7th., and as the plants exhibit symptoms, they are noted and subsequently replaced by a seedling for test. By the end of the year the following new seedlings were thus undergoing test:

S. 7 x S. 7	J.122, 124, 128, 142, 183	5
S. 5 x S. 7	J.187	1
S.20 x S.20	J.123	1
S.20 x S. 7	J.154, 175	2
S.40 x S.19	J.126	1
S — x S.19	J.191	1
S. 7 x Highgate	J.127	1
S.20 x Robusta	J.120, 134	2
G.M.x M. acum./B	J.173, 189	2
H x M. acum./B	J.202, 203	2
P.J. x M. acum./B	J.131, 135, 140, 141, 143, 147, 151 ..	7
		25

These were all planted between August and September and up to the end of the year had exhibited no sign of infection.

An experiment laid down in 1935 to test the susceptibility of the 'Highgate' variety to disease as compared with 'Gros Michel' was completed. A full report of the experiment has already been submitted and the results published. It suffices therefore to mention here that for commercial purposes the 'Highgate' is as susceptible to Panama Disease as the 'Gros Michel.'

5. Papaw Selection.

The search for a variety or species of *Carica* resistant to mosaic disease for use as a parent for raising commercial resistant varieties has continued, and the following varieties tested:—

Variety.	Source.	Reaction to Mosaic.
C. papaya—"Washington" ..	Bombay	Susceptible
" 'Gujarat' ..	Bombay	"
" Nos. 3612/3618 ..	Jamaica	"
C. candamarcensis ..	Ecuador	Test incomplete
C. chrysopetala ..	"	"
C. pentagona ..	"	died
C. dolecaula ..	Guatemala	Test incomplete
C. pubescens ..	"	"
C. zapota ..	"	"
C. sp. ..	Honduras	"
C. papaya ..	"	"

The last eight listed were inter-planted in a plot at Hope with 'Washington' and 'Gujarat' on October 5th., and were too young at the end of the year to have developed signs of the disease.

So far, all strains of *C. papaya* which have been tested have proven susceptible. *C. cauliflora* alone continues to exhibit immunity to mosaic, and has been crossed during the year with 7 commercial strains of *C. papaya*. The yield of seed was disappointing, and what little seed was obtained failed to germinate. This cross will be carried out on a larger scale next year.

6. Insect Pests.

During the period from March to October in which I acted as Government Entomologist no extensive outbreak of insect pests occurred and reports even of local outbreaks of serious importance were remarkably few and without exception proved amenable to control by the usual routine methods. During the period under review the activities of this division were confined to work of an advisory nature with one exception: experimental work on the seasonal intensity of the population of the Mango Fruit fly, *Anastrepha longimacula*, Greene, was continued. Traps were kept baited, visited at regular intervals and record of captures kept.

A number of requests for the Citrus Black Fly parasite *Eretmocerus serius*, Silv., were received and stocks of the wasp were distributed. The growing interest in Citrus cultivation is evidence by the fact that 25% of the enquiries dealt with were related to that crop. Several outbreaks of attack by the Fiddler beetle, *Prepodes vittatus*, L., were reported but were in each case found on examination to have been aggravated by poor field sanitation. Enquiries regarding the various scale insects affecting Citrus were numerous, as also were reports of leaf damage by the 'Orange Dog' and caterpillars of other *Papilio spp.* Other pests of this crop which were dealt with included the leaf weevil, *Lachnopus aurifer*, Dru., larvae of the 'skipper' butterfly, *Eantis thraso*, Hubner, an unidentified Lepidopteran larva and the Membracid *Idioderma varia*, which does not appear to have been recorded hitherto on Citrus in this country; the same insect was also submitted independently on material collected from an ackee tree, *Blighia sapida*.

No matters of importance relating to the Banana or Cane crops transpired. A specimen of the Rhinoceros beetle submitted was reported as attacking a banana corm but the attack was in all probability not to be regarded as primary. Trouble due to the scale, *Pseudaonidia articulatus*, on seedling bananas in the greenhouse at Hope, was successfully treated. Specimens of rotted sugar cane were received on several occasions and the damage proved in each case to be due to termite attack.

A number of enquiries regarding pests of truck crops were recorded and included:

Irish Potato	attacked by	Termites
Sweet Potato	" "	*Corecoris fuscus*, Thmb.
Cabbage	" "	*Plutella cruciferarum*, Zell. the Diamond—backed Cabbage Moth.
Asparagus	" "	*Chrysomphalus aonidum*, Red Scale.
Eggplant	" "	*Ligyrus tumulosus*, Burm., the May Beetle.
"	" "	*Corythaica monacha*. Stal.
Various Vegetables	" "	Crickets.

Enquiries concerning various fruits which were dealt with included: attack of the mango by the red-banded thrips, *Selenothrips rubrocinctus*, Giard, and the fruit fly. A specimen of a caterpillar feeding on papaw (*Carica papaya*) was identified as *Erinnys alope*, Drury, and the stem borer, *Apate terebrans*, Pall was found attacking Ginep (*Melicocca bijuga*) and divi-divi (*Caesalpinia coriaria*).

The three weevils, *Tribolium ferrugineum*, Fab., *Sitodrepa panicea*, L. and *Calandra granaria*, L., were found in a sample of stored ginger.

Numerous enquiries relating to insect attack of horticultural plants were received, among which several records of the incidence of Gladiolus thrips around Kingston suggest that this pest is spreading. Infestations of this nature included:

Chrysanthemum,	attacked by	Various scale insects
Cassia, Dahlia	" "	" " "
Hibiscus	" "	*Aulacaspis pentagona*, Targ.
Various seedlings	" "	Crickets, Millipedes.
Coleus	" "	*Orthezia insignis*, Doug.
Wampee (Clausena sp.)	" "	*Coccus viridis*, G.
Roses	" "	*Gymetis tristis*, F. the Rose Beetle.
Bahama grass (lawns)	" "	*Heliothis obsoleta*, F.

Finally, several insects not of economic import which were submitted for indentification, were also dealt with.

7. Miscellaneous.

A brief article entitled "The Highgate Banana and Panama Disease" reporting on an experiment referred to above, was published in the Journal of the Jamaica Agricultural Society Vol. XL p. 528.

The Departmental Staff Conference held at Hope on January 6th and 7th was attended.

A lecture and field demonstration of the banana breeding work was given in connection with the Annual Summer Course at Hope in July.

A visit was paid to the coastal areas of St. James and Hanover in November in connection with an outbreak of coconut wilt and a separate report on this visit has been submitted.

One meeting of the Advisory Committee on the Banana and Citrus industries was attended at the invitation of the Chairman when the results and prospects of the banana breeding programme were summarised.

Resultant upon the unification of the Colonial Agricultural Services during the year the official title of my post was changed from that of Geneticist to Botanist with effect from April 1st.

My thanks are again due to the Supervising Inspector of Plant Diseases for his able co-operation in the field work and to the executives and staffs of she following estates who have so willingly assisted: Banana Company of Jamaica, Caymanas Estates, Ltd., Messrs. Hawkins and Scott, P. Junor Esq., and Potosi Estates Ltd.

L. N. H. Larter,
Government Botanist.
15.4.37.

D.—Publications.

The following Departmental publications were issued during the year:—

Bulletin No. 6 (New Series)—"Insecticides to Control Inspect Pests in Jamaica" by W. H. Edwards.
Bulletin No. 7 (New Series)—"Dairy Farming in Jamaica," by J. W. Howe.
Bulletin No. 8 (New Series)—"A Survey of the Yields of Sugar Cane in Jamaica, 1934-1935,' —Report by H. H. Croucher.
Annual Report, 1935.

SECTION III.—FINANCIAL STATEMENTS.

A. Head VII.—Departmental Revenue, year ended 31st March, 1937—

	£ s. d.	£ s. d.
(C) *Science and Agriculture*:		
Fees Government Laboratory ..	171 1 0	
Fees Bee Inspectors ..	..	
Fees Agricultural Students	998 17 7	
Fees Grove Place Pasturage, etc.	271 8 11	
Fees Veterinary Department	2 4 9	
Fees Laboratory, Plantation and Garden ..	1,332 2 0	
Fees Citrus Nurseries	209 8 6	3,009 2 9
Head XI—Rents:		
Miscellaneous	..	6 0 0
Head XIII—Miscellaneous Receipts:		
Miscellaneous	..	12 2 4
Head V—Manurial Experiments with Bananas ..	..	480 18 3
		3,508 3 4

			£ s. d.
Deposits:			
D/A for Bitter Damsel Nursery	30 0 0		
John A. Roebling	103 14 3		
D/A for Banana Investigation	919 1 9		1,052 16 0
			£4,560 19 4

EXPENDITURE FOR THE YEAR ENDED 31ST MARCH, 1937.

	Personal Emoluments.		Other Charges.		Total.
HEAD XXXVI—Department of Science and Agriculture:	£ s. d.		£ s. d.		£ s. d.
Head Office	3,565 0 10	(a)	5,487 13 7		9,052 14 5
Public Gardens	912 14 0		2,560 18 2		3,473 12 2
Agricultural Expts. and Field Services	1,865 13 4	(b)	1,583 7 3		3,449 0 7
Disease of Animals and Plants	5,937 13 2		4,565 5 9		10,502 18 11
Stud Farm and Exptl. Station Manchester	820 2 1		1,332 15 6		2,152 17 7
Farm School	2,263 0 7		1,393 3 0		3,656 3 7
Research and Laboratories	5,619 2 9		1,574 1 0		7,193 3 9
Agricultural Produce Law 1926	4,585 17 2		1,251 4 0		5,837 1 2
Experiment Station, Hope	..		596 6 0		596 6 0
Miscellaneous	..	(c)	7,296 15 2		7,296 15 2
	25,569 3 11		27,641 9 5		53,210 13 4
HEAD IV—H. E. The Governor and Staff:	104 0 0		629 2 9		733 2 9
HEAD XXXVIII—Subventions:					
Grant in Aid of Bee Industry	..		254 10 8		254 10 8
HEAD XXXIX—Miscellaneous:					
Expenses Jamaica Banana Industry	..		2,201 14 6		2,201 14 6
Expenses re Officers on full pay leave	..		15 8 0		15 8 0
Refunds of Revenue	..		2 7 3		2 7 3
HEAD—Loan Expenditure Law 22 of 1935 1st Instalment:					
Agricultural Development-Tobacco Experiments	..		1,836 5 5		1,836 5 5
Irrigation Schemes	..	(d)	136 14 3		136 14 3
HEAD—Advances o/a Loans to be raised Law 22 of 1935, 2nd Instalment:					
Director Agriculture—Tobacco Development—"Grading Station"	..		1,907 3 3		1,907 3 3
HEAD—General Advances:					
Director Agriculture for Advances to Tobacco Growers	..		1,271 0 6		1,271 0 6
Director Agriculture for preliminary investigations loan schemes	..		692 4 10		692 4 10
Director Agriculture—Tobacco Station Working Account	..		38 9 4		38 9 4
HEAD—Deposits:					
Director Agriculture for Bitter Damsel Nurseries	..		53 18 7		53 18 7
John A. Roebling	..		286 19 9		286 19 9
	25,673 3 11		36,967 8 6		62,640 12 5

(a) Includes £5,374 19s. 11. Travelling Expenses for entire Staff of the Department
(b) Includes £480 18s. 3d. Reimbursement for Manurial Experiments with Bananas as shown under Revenue Head V.
(c) Includes £4,103 18s. 3d. for Development of Agricultural Industries and £2,600 for acquisition of additions to Citrus Packing House.
(d) Also included in total expenditure under these schemes by the Public Works Department.

N. B. DONALDSON, Accountant.

Hope Stock Farm, Year ended December 31, 1936.—Cash Appropriation.

Receipts.			Approved Estimates.	Revised Estimates.	Actual	Disbursements.			Approved Estimates.	Revised Estimates.	Actual.
			£	£	£ s. d.				£	£	£ s. d.
Balance on 31.12.35			2,765	2,765	2,765 2 0	*Personal Emoluments*—					
Milk Sales			4,900	5,502	5,501 14 5	Accountant			150	150	150 0 0
Butter Sales			175	94	93 15 3	Cashier			140	140	140 0 0
Livestock Sales			200	210	210 9 0	Farm Superintendent			50	50	50 0 0
Poultry Sales			30	42	42 7 3	Contribution to Pensions			26	26	25 10 0
Rents			200	172	172 6 10	Foreman			165	165	164 11 8
Bombay Mango Sales			400	603	607 18 3	Wages			1,500	1,534	1,534 3 7
Pine Sales			15	8	7 12 9	Rent, Commission			40	23	23 2 3
Miscellaneous:—						Fruit, Commission			55	72	71 14 8
Interest (Bank)	£42 6 11					Clerk and Storekeeper			110	110	110 0 0
Stud Fees	14 4 2								2,236	2,270	2,269 2 2
Truck (Reimbursement)	65 9 7					*Other Charges*—					
Food for Stock (Reimbursement)	112 18 7					Food for Stock:—					
Machinery (Sale)	12 0 0					Growing Canes		104 0 11			
(Furniture and Fixtures (Sale)	1 3 5					Growing Guinea Corn		82 15 3			
Sundries	118 8 7		175	371	366 11 3	Manufacturing Guinea Corn Silage		123 8 3			
						Manufacturing Grass Silage		23 4 3			
						Poultry Feed		35 18 11			
						Imported and other Feeds		1,644 15 9	1,400	2,014	2,014 3 4
						Crops: Plantation Pines			10	..	..
						Rearing Calves			10	1	0 15 0
						Cleaning and Fencing			500	659	659 7 6
						Building, Machinery and Equipment:—					
						Purchase of New Truck		201 17 9			
						Buildings		378 2 1			
						Machinery		17 10 4			
						Furniture and Fixtures		34 3 5			
						Stores and Parts		0 16 6			
						Vehicles and Harness		167 14 9			
						Tools and Implements		188 5 11			
						General Repairs		377 11 7			
						P. W. Dept. Adv. for work		29 16 5	1,500	1,402	1,395 18 9
						Purchase of Live Stock			500	244	244 2 9
						Option on "Hope Pastures"			..	50	50 0 0
						Ja. Government Stables at Grove Place			..	137	137 5 5
						Miscellaneous:—					
						Truck Wkg. Account		187 0 6			
						Rents (Expenses)		0 11 0			
						Bombay Mangoes Exps.		54 12 10			
						Butter Expenses		9 4 2			
						Valuation Expenses		16 14 0			
						Poultry Expenses		8 6 6			
						Taxes		13 6 0			
						Sundries		266 5 7	550	530	536 0 7
			8,860	9,767	9,767 17 0	Balances: In Bank, Nova Scotia		332 6 2	6,706	7,307	7,306 15 6
						" Govt. Savings Bank		2,128 5 4			
						" Hand to be lodged		0 10 0	..	..	2,461 1 6
					9,767 17 0						9,767 17 0

A. C. Barnes, Director of Agriculture.

N. B. Donaldson, Accountant.

HOPE STOCK FARM, Year ended December 31, 1936.

Dr. PROFIT AND LOSS ACCOUNT. Cr.

	£ s. d.	£ s. d.		£ s. d.
To Depreciation:			By Rents	148 13 7
Buildings	150 7 5		Bombay Mangoes ..	480 3 9
Machinery	134 15 5	..	Milk	5,515 18 0
Furniture and Fixtures	71 9 4	..	Butter	97 12 0
Truck	50 6 9	..	Interest (Bank) ..	42 6 11
Tools and Implements	43 9 3	..	Stud Fees	14 4 2
Vehicles and Harness	15 8 0	..	Miscellaneous ..	85 17 7½
Stores and Parts	0 5 0	466 1 2	Balance Net Loss for the year	409 4 9½
Repairs and Upkeep:				
Buildings	145 15 9			
Machinery	19 10 4			
Furniture and Fixtures	8 14 9			
Tools and Implements	34 8 2			
Vehicles and Harness	165 2 9			
General	375 1 1	748 12 10		
Truck (running expenses)	..	115 19 4		
Food for Stock (consumed) ..	..	2,011 17 5		
Plantation (Pines)	..	17 1 9		
Taxes	..	13 6 0		
Cleaning and Fencing	..	659 3 6		
Wages	..	1,534 3 7		
Accountant	..	150 0 0		
Cashier	..	140 0 0		
Foreman	..	164 11 8		
Farm Superintendent	..	50 0 0		
Contribution to Pensions ..	..	25 10 0		
Clerk and Storekeeper	..	110 0 0		
Poultry	..	12 18 3		
Live Stock	..	312 1 0		
Miscellaneous Expenses	..	262 14 4		
		6,794 0 10		6 794 0 10

A. C. BARNES, Director of Agriculture.

N. B. DONALDSON, Accountant.

Hope Stock Farm, Year ended December 31, 1936.

Balance Sheet.

Assets.	£ s. d.	£ s. d.
Buildings—		
As at 31.12.35 ..	4,703 11 3	
Additions ..	232 6 4	
	4,935 17 7	
Depreciation ..	150 7 5	4,785 10 2
Machinery—		
As at 31.12.35 ..	1,085 5 8	
Additions ..	18 14 8	
	1,104 0 4	
Sold £12 0 0		
Depreciation 134 15 5	146 15 5	957 4 11
Furniture and Fixtures—		
As at 31.12.35 ..	1,062 16 7	
Additions ..	48 19 11	
	1,111 16 6	
Sold £1 3 5		
Depreciation 71 9 4	72 12 9	1,039 3 9
Truck—		
As at 31.12.35 ..	30 0 0	
Addition ..	215 6 9	
	245 6 9	
Sold £15 0 0		
Depreciation 50 6 9	65 6 9	180 0 0
Tools and Implements—		
As at 31.12.35 ..	141 11 4	
Additions ..	154 7 9	
	295 19 1	
Depreciation ..	43 9 3	252 9 10
Vehicles and Harness:—		
As at 31.12.35 ..	233 3 0	
Additions ..	2 12 0	
	235 15 0	
Depreciation ..	15 8 0	220 7 0
Stores and Parts—		
Stock as per Inventory ..	..	176 3 11
Food for Stock—		
Stock as per Inventory ..	..	864 9 3
Livestock—		
Cattle and Horsekind ...	7,108 13 0	
Poultry	67 5 0	7,175 18 0
Accounts Receivable—		
E. Downes ..	1 4 9	
R. A. Amiel ..	0 7 1	
Gen. Penitentiary ..	12 1 6	
Ivan Tomlinson ..	0 11 8	
W. T. Domville ..	0 11 6	
Hon. A. C. Barnes ..	0 14 2	
Hope Gardens Transport	3 2 11	
Jubilee Hospital ..	23 7 10	
L. S. Marston ..	0 1 1	
Lunatic Asylum ..	152 0 3	
Miss M. Grant ..	0 7 9	
A. Burrowes ..	0 0 8	
Hugh Miller ..	0 15 10	
L. A. Boothe ..	0 5 8	
Hon. Major T. Hallinan	0 17 0	
Alfred James ..	0 14 2	
H. P. Smart ..	1 18 3	
Public Works Dept. ..	29 16 5	
W. L. Barnett ..	0 11 8	
O. W. Harrison ..	1 13 2	
Public Hospital ..	290 10 7	..
Tuberculosis Hospital ..	32 10 0	
O. L. Crichton ..	0 0 4	
Farm School ..	7 0 8	
G. E. Redshaw ..	0 14 6	561 19 5
Hope Pastures "Deposit o/a Purchase"		50 0 0
Jamaica Government, Advance o/a New Stables Grove Place ..		137 5 5
Government Savings Bank "Deposit A/c"		2,128 5 4
Bank of Nova Scotia "Current A/c"		332 6 2
Cash in hand "to be lodged" ..		0 10 0
		£18,861 13 2

Liabilities.	£ s. d.	£ s. d.
Deposits—		
W. B. Dixon ..	0 0 1	
H. M. A. S. Australia ..	0 4 9	
Ansley Webster ..	0 9 0	0 13 10
Accounts Payable—		
Treasurer for Canadian Agents	109 7 3	
Treasurer for New York Agents	101 18 8	
Treasurer for Crown Agents	25 13 6	236 19 5
Jamaica Government—		
Balance of grant for setting up Livestock ..	422 7 1	
Less paid off during year for one Aberdeen Angus Bull purchased for Grove Place Stud Farm ..	143 2 9	279 4 4
Profit and Loss—		
As at 31.12.35 ..	18,754 0 4½	
Less Loss for the year ..	409 4 9½	18,344 15 7
		£18,861 13 2

A. C. Barnes, Director of Agriculture.

N. B. Donaldson, Accountant.

SECTION IV.—LEGISLATION AFFECTING AGRICLTURAL INDUSTRIES

A. Laws relating to Agriculture passed during the year 1936.

Law No.	Date Assented to	Short Title.	Chief Provisions.
16	9th July, 1936	Agricultural Societies (Special Loans) Law 1936	To enable Agricultural Loan Societies to which advances are made from Public Funds to make loans of a special class.
19	14th Dec., 1936	Sugar Industry Control Amendment Law, 1936.	To amend the Sugar Industry Control Law 1933 by substituting The Sugar Manufacturers' Association (of Jamaica) Limited for the Sugar Manufacturers Board in Section 3, Sub-section (2) and Section 5, Sub-section (1).
20	14th Dec., 1936	Jamaica Banana Producers Association Limited Reconstitution Law 1936	To reconstitute the Jamaica Banana Producers Association, Limited, into a Trading Company.
21	14th Dec., 1936	Jamaica Banana Producers Association Limited Debenture Law 1936	To provide for the issue by the Jamaica Banana Producers Association Limited of Debentures and for Government Guarantee of such Debentures.
24	24th Dec., 1936	Banana Industry Regulation Law 1936	To enable the Regulation and better control of the Banana Industry by providing for (1) the appointment of a Banana Registration Authority to receive, file and register copies of all Banana Contracts and Export Agreements and the Summaries and Certificates deposited with it; to investigate alleged breaches of Banana Contracts; to investigate and make recommendations to the Governor in regard to any matter affecting the welfare of the Banana Industry; (ii) the issue of Export Licenses; (iii) the establishment of a Banana Control Board.

B. Orders, Rules, Etc., relating to Agriculture Published during the Year 1936.

Date.	Description.	Subject.
11th Feb., 1936	Order under Law 10 of 1925	The Protection from Plant Disease (Gladiolus Thrips) Order 1936 declaring all that area situate within a radius of six miles from the Court House in the town of Mandeville in the parish of Manchester to be infected with *Taeniothrip Gladioli* or Gladiolus Thrips.
22nd Feb., 1936	Amendment to Law 17 of 1929	Bullet Wood and Sweet Tamarind added to the Schedule to Law 17 of 1929. The Sale of the Bark of Trees (Prevention) Law, 1929.
18th March, 1936	Regulations under Law 19 of 1926	Prohibiting the exportation of any of the vegetables or fruits mentioned in the schedule thereto unless packed at the Low Temperature and Marketing Experiment Station of the Department of Agriculture or any subsidiary packing houses controlled by that Department. The quantities to be shipped to be regulated by the Advisory Board under the Agricultural Produce Law, 1926. Said vegetables and fruits for export to be gathered collected and transported in such manner and in such containers approved by an Inspector of Produce and to be of standard size and quality. Containers to be labelled, tagged or marked as required by the Director of Agriculture. Regulations not applicable to *bona fide* ships' stores or consignments not exceeding five crates or packages shipped for private purposes and not for sale in country of destination.
27th April, 1936	Order under Law 11 of 1932	Permitting importation of Race Horses from Haiti
21st May, 1936	Order under Law 31 of 1933	Fixing export and local quotas for the year 1935-36 sugar crop at 85% and 15% respectively.
29th Sept., 1936	Regulations under Law 19 of 1926	All limes for export shall be (a) fully mature, green in colour, juicy, clean and free from bruises, blemishes and rots of all kinds; (b) wrapped in paper approved by the Chief Inspector of Produce; (c) packed in container approved by the C.I.P. Each container shall be marked to indicate the number of limes contained in it and otherwise marked as directed by C.I.P.
16th Nov., 1936	Amendment to Law 17 of 1929	Dogwood added to the Schedule to Law 17 of 1929, The Sale of the Bark of Trees (Prevention) Law 1929.
23rd Nov., 1936	Order under Law 19 of 1926	Tobacco added to Sixth Schedule of Law 19 of 1926, The Agricultural Produce Law 1926.
30th Nov., 1936	Order under Law 24 of 1890	Importation of frozen or chilled, cured or pickled carcases permitted under specified conditions.
10th Dec., 1936	Order under Law 10 of 1925	Revoking Protection from Plant Disease (Gladiolus Thrips) Order 1936.

APPENDIX NO. 1.

Report of the Agricultural Development Board covering the period from its inception to the 31st December, 1936.

On the 7th May, 1935, on a motion by the Honourable Member for St. Thomas, the Legislative Council adopted the following Resolution:—

"1. That this Council is of the opinion that in any programme recommended for their approval for expenditure of monies borrowed for development and improvement purposes provision be made for expenditure on projects having as their object the development of agriculture.

"2. That in order to assure such programme being carried out the Council recommends His Excellency the Governor to set up a special Board to be termed "The Agricultural Development Board" for the purpose of considering projects of agricultural development and to make representations to the Government from time to time as to any expenditure in that direction."

2. Accordingly, a special Board styled "The Agricultural Development Board" was appointed by the Governor with the following terms of reference:—"To consider and report upon projects of agricultural development in connection with the loan which it is proposed to raise shortly, and to consider any further items in connection with agricultural projects which may be laid before the Board for their recommendations."

The following members were appointed to the Board:—

The Honourable A. C. Barnes, Chairman,
The Honourable A. H. Hodges,
The Honourable R. Ehrenstein,
The Honourable G. C. Wainwright,
The Honourable Ellis Levy,
The Honourable C. A. Reid,
Sir Charlton Harrison, Kt., C.I.E.
Mr. R. F. Williams, representative of the Jamaica Imperial Association.

Notification of the formation of this Board was published in the Jamaica Gazette under Government Notice No. 873, of the 21st November, 1935.

3. The Board held its first meeting on the 27th November, 1935, and to date has held thirteen meetings in all, the attendance of members having been as under:—

The Honourable A. C. Barnes, Chairman	13
The Honourable A. H. Hodges	11
The Honourable R. Ehrenstein (absent from the Island for 2½ months)	6
The Honourable G. C. Wainwright	8
The Honourable Ellis Levy (absent from the Island for 2 months)	2
The Honourable C. A. Reid	12
Sir Charlton Harrison (absent from the Island for 2 months	12
Mr. R. F. Williams (absent from the Island for 2 months)	9

4. Through its Chairman the Board has kept constant and close touch with the Department of Agriculture and Science, while the appointment of the Assistant Colonial Secretary as Secretary has facilitated liaison with Government. The Board has also been in frequent communication with the Jamaica Agricultural Society in regard to various apsects of agricultural development, and has had under consideration projects submitted by local organisations and interested members of the public.

To give some idea of the scope of the Board's activities it may be of interest to enumerate the following as being some matters which have come under its purview:—

Development of Tobacco Industry.
Development of the Minor Fruits and Vegetable Industry.
Organisation for marketing of agricultural products.
Proposals of the Jamaica Food Products Industry, Ltd., for the establishment of a local factory for the treatment and export of local agricultural products.
Development of Citrus Industry.
Assistance to the Dairy Industry.
Overhead Irrigation.
Local manufacture of Cornmeal.
Establishment of Local Meat Cannery.
Organisation of Fishing Indsutry at Alligator Pond.
Cost of Refined Sugar for locally manufactured products.

5. In accordance with its terms of reference the Board has primarily concentreated on the consideration and formulation of schemes for submission to Government in connection with the development loan programme. At an early stage the Government approved of the allocation of a sum of £1,000 to the Board for the purpose of financing necessary enquiries and preliminary investigations. Expenditure from this amount has so far been incurred in investigations connected with the development of the Minor Fruits and Vegetable Industry and proposals for assisting the Dairy Industry.

6. The Board has adopted the following principles in giving consideration to the various projects of agricultural development which have come under its notice.

The project must give promise of being developed within a reasonable period to a stage of economic production which will enable the commodity produced to be marketed successfully at home or abroad on a competitive basis, without greater protection and assistance from Government than apply to commodities with which it will have to compete.

Before making recommendations for the establishment of any new agricultural development or enterprise the Board must secure sufficient reliable data, to be specified, of its prospects of success as a commerical undertaking, and if necessary will recommend expenditure in order to secure such information.

The Board considers that as a general rule such capital expenditure which may be necessary to establish special facilities for the handling or manufacture of a particular product and the overhead expenses including capital charges and field and factory supervision, should be borne from Loan funds during the initial period in order that the new enterprise may be soundly established, and that where necessary highly trained and experienced specialists should be employed for definite periods so that the best advice and instruction may be available at all stages of production, manufacture and marketing of the commodities involved.

The Board regards such expenditure as a subsidy to the particular industry concerned, intended to enable it to overcome and survive its initial difficulties and to avoid the risk of disappointment and discouragement to producers during the early years of the development of new schemes.

7. Under the head of Agricultural Development a sum of £5,000 was provided in the first instalment of the loan authorised by Law 22 of 1935 and in respect of this sum the Board prepared and submitted to Government a three-year programme for the development of the local tobacco industry and the establishment of proper marketing facilities for this product.

This scheme which involved utilising the whole of the £5,000 provision was approved by the Government and the Secretary of State for the Colonies. On the advice of the Board, Mr. Winckley was engaged for a period of three years as Tobacco Specialist. The scheme is now in full operation. Experimental and demonstration stations have been established at three centres in St. Andrew by the Government and trial plots planted in St. Elizabeth, Manchester and Portland. A number of local growers have been assisted by means of Government loans under the Agricultural Loans Law 1887 and contracts entered into with them for the planting of 119 acres in Clarendon and St. Andrew. Agreements with these growers have been completed providing amongst other things for the marketing of the crop to be done under Government control and supervision.

8. At an early stage it became apparent to the Board that the £5,000 provided in the first instalment was quite inadequate to meet urgent local requirements and representations were, therefore, made to Government with a view to further sums being made available. With the approval of the Secretary of State for the Colonies the Government agreed that consideration should be given to further schemes submitted by the Board up to a total of £20,000 in addition to the £5,000 already provided.

9. The Board devoted attention to a scheme for the development of the Minor Fruits and Vegetable industry. On its representations Mr. F. E. V. Smith was sent to the United States of America and Canada to make certain investigations connected with this industry, particularly in regard to a canning and juicing plant. After full consideration the Board has submitted to Government a three-year scheme for the development of this industry. Very valuable work has been done by the Department of Agriculture and Science at its Low Temperature Station, but in view of the increase in the number of local growers the facilities and accommodation of this Station which was established for investigational work are quite inadequate for commercial-scale operations. The proposals therefore include the erection of a new packing and cooling house with the necessary machinery, together with a technical scale canning and preserving unit. The cost of the scheme over a period of three years is estimated at £16,140, including provision for the staff.

10. In view of the rapid growth of certain aspects of agricultural development the Board considered it very necessary that a special officer should be appointed who would be responsible for keeping close touch with the situation and also for dealing with the marketing of such produce. The Board has, therefore recommended to Government that there should be an Agricultural Development and Marketing Officer paid from loan funds, and that an amount of £3,270 should be set aside to cover his salary and travelling expenses in respect of the next three years.

11. The above proposals, which have been accepted in principle by the Government, together with the sum of £2,000 allotted from loan funds for the building of a tobacco grading and packing house on the Spanish Town Road, rather more than dispose of the £20,000 further advance which the Government was prepared to make. The Board, however, has under consideration still further projects for the utilisation of loan funds up to the full £35,000 which it is proposed to make available under the first and second loan instalments.

The position is briefly set out hereunder:—

First Instalment		£5,000
Second Instalment (proposed)		30,000
Approved three-year tobacco Development Scheme	£5,000	
Tobacco packing and grading house	2,000	
For preliminary investigations and enquiry	1,000	
Proposed three-year Minor Fruits and Vegetable Development Scheme	16,140	
Agricultural Development and Marketing Officer for three years	3,270	
	£27,410	
Balance available for further schemes	7,590	
	£35,000	£35,000

For utilising this balance the Board is closely considering a scheme for the assistance of the local Dairy Industry by establishing a modern butter factory. These proposals are not at the present moment ripe for submission to the Government, but preliminary investigations in regard to site, machinery, etc., have taken place, and the Board is in close touch with the Manchester Dairymen's Association.

12. It may not be out of place here to touch briefly on the other matters referred to above which have come before the Board during the last year. The Board has been in touch with Mr. Ashenheim of the Jamaica Food Products, Ltd., in regard to the possibility of Government giving certain financial guarantees. This is a proposal which needs very careful examination and while having given the matter considerable thought, the Board is not in a position to submit recommendations.

13. In regard to the Citrus Industry, the Board was able to arrange for Colonel Pomeroy who has had very detailed and wide experience of the development of the Citrus Industry in South Africa to give two lectures under the auspices of the Jamaica Agricultural Society. It was evident that those attending these meetings much appreciated the opportunity which had been afforded them.

14. In regard to the matter of Overhead Irrigation, the Board has been in touch with the Department of Agriculture and Science and experiments are being made at the Low Temperature Station.

15. The position in regard to the local manufacture of cornmeal the establishment of a meat canning factory, the organisation of the fishing industry and the matter of the use of refined sugar in local industries are still under examination by the Board which is keeping close contact with the interest concerned.

A. C. Barnes,
Chairman,
8th March, 1937.

APPENDIX NO. 2.

AGRICULTURAL LOAN SOCIETIES BOARD.

Report for the year ended 31st December, 1936.

Office of the Agricultural Loan Societies Board,
Kingston, Jamaica, 30th January, 1937.

Sir,

We, the Agricultural Loan Societies Board, appointed under Law 6 of 1912, have the honour to report in accordance with Section 8 of the same Law, for the information of His Excellency the Governor and the Honourable Legislative Council, our proceedings for the year 1936.

2. It is with regret that we record the resignation of Mr. Thomas Kemp, through ill health. Mr. Kemp's long experience, his business knowledge and sound common sense made him a very valuable member.

3. Sir Charles W. Doorly, Kt. C.B.E., was appointed a member on 28th December, 1935, and took his seat on 3rd January, 1936. The Hon. A. H. Hodges was appointed a member on 30th June, 1936.

Board.

4. During the year, eleven regular and three special meetings were held. The attendance of members during the year is shown hereunder:—

Hon. A. C. Barnes, C.M.G., Chairman	13
Hon. J. W. N. Hudson ..	8
Hon. D. H. Hall, I.S.O.	13
Hon. C. A. Reid	10
Hon. H. E. Allan	8
Hon. H. I. C. Brown, K.C.	7
Mr. P. W. Sangster	11
Mr. H. V. Alexander	9
Hon. Sir Charles Doorly, Kt., C.B.E.	13
Hon. A. H. Hodges	4

5. The Hon. H. I. C. Brown, K.C., and the Hon. J. W. N. Hudson were on leave of absence during the year.

Staff.

6. The Secretary was on leave of absence for twelve weeks during which time the Inspecting Officer acted as Secretary.

Work of the Board.

7. During the year, communications from the various Banks and the Government, and reports on inspections of Banks were dealt with.

Loan under Law 6 of 1912.

8. In 1936, loans amounting to £3,620 were made, as against £800 in 1935. We consider that this reflects the necessity for credit among small planters and a return of confidence in the Banks. The incidence of Panama Disease of bananas in many districts, has caused the Banks concerned to exercise great caution in issuing loans on account of the difficulty which is being experienced in recovering advances already made. The whole question is under careful consideration by the Board.

9. Repayments amounted to £5,856 16s. 0d. as against £2,216 3s. 8d. in 1935. This includes £3,883 6s. 8d. settled as a result of the Western St. Mary Land Settlement Scheme having been taken over by the Lands Department (referred to later), leaving net cash repayments amounting to £1,973 9s. 4d. This is regarded as satisfactory, having regard to the conditions which obtained after the hurricane of 1935.

10. Loans made and allocated during 1936, exhausted the balance of the allocation of £10,000 voted by the Legislative Council on 30th May, 1935, for making loans under Law 6 of 1912. A further amount of £10,000 was voted by the Legislative Council on 17th December, 1936.

Interest.

11. £318 4s. 1d. was paid during the period, leaving £54 15s. 4d. owing, £53 15s. 10d. by one Bank and 19s. 6d. by another. Interest for December quarter, payable on 31st December has been paid all but £6 0s. 7d., and this is regarded as an indication of the realization of the Banks of their obligations, and their desire to end their financial year free from arrears of interest.

Total Loans Made.

12. Total loans made to Banks since the inception of operations is £169,127 8s. 0d., and the balance outstanding at the end of the year under review was £29,875 3s. 9d.

Payments Generally.

13. When a Bank obtains a loan, it signs a form of receipt setting out fixed times of repayments, but after the occurrence of a storm it cannot be expected that such terms can be strictly adhered to, for obvious reasons. It is not considered advisable in such cases to fix fresh terms of an agreement, but rather to enter into an arrangement to extend the term of the loan, on the understanding that the Bank will make remittances as it is able. This has been found to work well in practice. Care is taken that such an agreement is not taken advantage of, and that the internal discipline of the Bank does not slacken.

Hurricane Loans.

14. Loans amounting to £23,100 were made under this head to 27 Banks, Law 16 of 1936, was subsequently passed. The Law is retrospective in effect on these loans, and at the same time provides for the issue of loans in the event of material injury to the agricultural industries in the Island in the future. Its provisions are similar to those of Law 24 of 1917. The sum of £1,000 was made available to the Banana Industry Aid Board for the purpose of making loans in the Spalding and Christiana districts, the Loan Banks in which declined to handle Hurricane Loans. No part of this, however, was utilized by that Board.

15. A schedule is attached giving details of these loans. £1,189 15s. 9d. was refunded, having been unexpended from various causes—such as lack of proper legal security offered by applicants to Banks, failure to apply for second instalments by borrowers, and reduction of amounts originally intended to be loaned after inspection of the security. The Board consider that the circulars issued in the previous year to which reference is made in the Report for 1935 had a good moral effect in causing the Banks to exercise caution in dealing with applications.

16. Although the first instalment of loan, with interest, is not payable until 30th April, next, £1,068 1s. 6d. had already been repaid by the close of the period, making, with the unexpended £1,189 15s. 9d., a total repayment of £2,257 17s. 3d., thus leaving a balance of £20,482 2s. 9d. outstanding. During January, 1937, a further £135 18s. 10d. has been paid.

17. In the light of the above, it is felt that there are good grounds for hoping that the collections of Hurricane Loans will be satisfactory.

Land Settlement.

18. The Lower Trelawny Bank reduced its loan of £3,000 to £275, as a result of the revival of interest in cane growing in the district which is served by that Bank. It is hoped that this balance will soon be paid off, when the Bank will be able to employ further collections from purchasers of land in its ordinary banking business, to the benefit of itself and the community.

19. The Report of the Select Committee of the Legislative Council appointed to investigate the affairs of the Western St. Mary Bank was approved by the Legislative Council on 16th June, 1936, and action taken thereon. The Lands Department took over the unsold lands and outstanding accounts in respect of Pembroke Hall, Donnington and Decoy, and the Bank was relieved of its liability of £3,883 6s. 8d. under Law 6 of 1912.

20. The Friendship Land Settlement Scheme is the only one now remaining on our books, so that the Schedule of Lands Settlement Loans is omitted from this Report.

General Remarks.

21. The year must be regarded as one of considerable activity. Hurricane Loans were issued to the extent of £23,100. This of necessity increased the work of the Board, but without additional expense to Government. The addition of 6 Banks to the Register also increased the volume of work.

22. In recent years, with the approval of Government, the Board has adopted a more progressive policy. Government has been informed of the manner in which these activities can be extended to meet the need of agricultural credit.

23. For some time, the Board has urged the desirability of a reduction in the rate of interest on loans, and after due consideration Government acquiesced and the rate of interest on all loans has now been reduced to 3% per annum, with effect from 1st July, 1936. It is expected that this will cause an increase in the number of applications for loans, and expand the business of the Banks. Explanatory circulars were issued to all Banks on this subject. Banks have been asked to report on the action taken to pass on to borrowers the benefit of the reduction in the rate of interest.

24. Owing to certain reports which came under notice, the Board recommended to Government that Law 33 of 1902 be amended to empower the Registrar to refuse to register a new Bank, without the certificate of the Board that such registration is desirable. It is hoped thereby to prevent the unnecessary establishment of Banks in districts already sufficiently served, and of Banks which will not fulfil the purpose for which Loan Banks are intended.

25. Loan Banks have been of great service to the people of Jamaica, and, with proper encouragement and control, they are capable of greatly extending their usefulness. The moral benefit of teaching the people business habits and a proper regard for meeting their obligations can hardly be estimated.

We have the honour to be,
Sir,
Your obedient Servants,
THE AGRICULTURAL LOAN SOCIETIES BOARD.
A. C. Barnes,
Chairman.
C. J. HAY,
Secretary.
30th January, 1937.

The Honourable
The Colonial Secretary,
Kingston.

Loans made to Loan Banks under Law 6 of 1912, 37 of 1916, 24 of 1917 and 16 of 1936.

Parish.	Law 6 of 1912.		Law 36 of 1912.		Law 37 of 1916.		Law 24 of 1917.	
	No. of Banks.	Loans.	No. of Banks.	Loans.	No. of Banks.	Loans.	No. of Banks.	Loans.
		£ s. d.		£ s. d.		£ s. d.		£
St. Andrew	2	2,000 0 0	..	..	1	400 0 0	..	..
St. Thomas	2	1,000 0 0	..	..	1	140 0 0	1	500
Portland	5	7,868 4 0	1	1,995 0 0	3	3,586 3 4	3	3,000
St. Mary	7	12,506 5 0	5	20,918 0 0	6	13,237 6 9	4	3,400
St. Ann	3	3,550 0 0	1	1,160 0 0	..	..	..	..
Trelawny	4	3,100 0 0	1	2,099 10 0	..	..	..	..
St. James	2	950 0 0	1	4,154 0 0	1	1,598 14 8	..	..
Hanover	1	1,750 0 0	1	3,531 10 0	1	628 13 1	..	..
Westmoreland	2	2,478 6 8	1	3,439 0 0	1	615 0 0	..	..
St. Elizabeth	1	400 0 0	..	..	..	..	..	..
Manchester	4	1,315 0 0	2	987 10 0	1	350 0 0	..	..
Clarendon	5	5,690 0 0	4	5,508 0 0	2	586 14 6	..	..
St. Catherine	4	22,930 0 0	1	5,028 10 0	3	3,626 0 0	..	..
	42	65,537 15 8	18	48,821 0 0	20	24,768 12 4	8	6,900

SUMMARY.

		£ s. d.
Under Law 6 of 1912		65,537 15 8
36 of 1912	£48,821 0 0	
37 of 1916	24,768 12 4	
24 of 1917	6,900 0 0	80,489 12 4
16 of 1936	(see Schedule)	23,100 0 0
Totals Loans made		£169,127 8 0

Repayments made under Law 6 of 1912 during 1936.

Parish.	No. of Banks.	Repayments made.
		£ s. d.
St. Andrew	1	22 12 3
Portland	2	81 17 1
St. Mary	2	3,938 6 8
St. Ann	3	313 6 8
Trelawny	1	40 0 0
Hanover	1	95 0 0
Westmoreland	1	114 13 4
St. Elizabeth	1	100 0 0
Manchester	1	11 0 0
Clarendon	3	235 0 0
St. Catherine	3	905 0 0
	19	£5,856 16 0

Interest paid during 1936 *under Law* 6 *of* 1912.

Parish.	Interest paid.
	£ s. d.
St. Andrew	20 12 10
St. Thomas	5 7 10
Portland	13 6 6
St. Mary	23 15 9
St. Ann	28 16 4
Trelawny	28 8 4
St. James	1 11 3
Hanover	22 12 4
Westmoreland	22 12 6
St. Elizabeth	2 15 0
Clarendon	49 14 2
St. Catherine	98 11 3
	£318 4 1

Loans under Law 16 *of* 1936—*Hurricane Loans.*

	Loan.	Refund.	Paid.	Balance.
	£	£ s. d.	£ s. d.	£ s. d.
Alexandria ..	100	..	0 10 0	99 10 0
Central Portland ..	1,700	181 15 0	184 6 7	1,333 18 5
Central St. Mary ..	3,000	163 0 0	44 19 6	2,792 0 6
Cornwall County ..	1,250	226 6 9	55 9 0	968 4 3
East Portland ..	700	..	11 10 2	688 9 10
Eastern St. Ann ..	400	..	26 9 4	373 10 8
Eastern St. Mary ..	1,000	117 0 0	..	883 0 0
Eastern St. Thomas ..	400	6 10 0	33 3 10	360 6 2
Frankfield	200	..	35 0 0	165 0 0
Glengoffe	350	..	21 12 9	328 7 3
Guy's Hill-Carron Hall ..	650	..	..	650 0 0
Hanover	275	..	20 0 0	2255 0 0
Lawrence Tavern ..	150	..	..	150 0 0
Long Bay	700	79 13 6	21 13 4	598 13 2
Morant Bay	400	3 0 0	..	397 0 0
Northern St. Catherine ..	2,750	13 6 0	146 12 3	2,590 1 9
Northern St. Mary ..	925 0 0	..	147 6 5	777 13 7
Port Antonio ..	800	204 0 0	13 1 0	582 19 0
Port Maria	800	1 10 0	80 11 6	717 18 6
St. George	700	89 10 0	..	610 10 0
St. Thomas-ye-Vale ..	2,150	96 4 6	54 6 0	1,999 9 6
Southern St. Mary ..	350	..	20 0 0	330 0 0
Stony Hill ..	300	8 0 0	1 0 0	291 0 0
Trinity Ville	250 0 0	..	13 0 0	237 0 0
Upper Trelawny ..	200	..	31 13 6	168 6 6
Western St. Mary ..	2,525	..	105 16 4	2,419 3 8
Yallahs	75	..	..	75 0 0
	£23,100	£1,189 15 9	£1,068 1 6	£20,842 2 9

SUMMARY.

	£ s. d.
Refunds ..	1,189 15 9
Repayments ..	1,068 1 6
Balances ..	20,842 2 9
	£23,100 0 0

Total Loans made to Loan Banks to 31st December, 1936.

Bank.	Details of Loan Settled.	Loans Settled.	Repayable by	Law 6/12 Loans Current.	Law 6/12 Loans Balances outstanding.	Hurricane Loans 1936.	Hurricane Loans Balances outstanding.	Total Loans issued.	Total Balances outstanding.
		£ s. d.		£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.
Stony Hill ..	Hurricane	400 0 0	1934	400 0 0	100 0 0	..			
			1936	200 0 0	130 0 0				
	Law 6/12	1,000 0 0	1936	200 0 0	190 0 0	300	291 0 0	2,500 0 0	711 0 0
Lawrence Tavern ..	do.	..	1937	75 0 0	20 9 8	150	150 0 0	350 0 0	170 9 8
Trinity Ville ..	Hurricane	640 0 0	..	..	..				
	Law 6/12	450 0 0	1939	250 0 0	250 0 0	250	237 0 0	1,590 0 0	487 0 0
Yallahs ..	..	..	..	..	..	75	75 0 0	75 0 0	75 0 0
Eastern St. Thomas	..	..	..	..	..	400	360 6 2	400 0 0	360 6 2
Morant Bay ..	..	..	..	..	..	400	397 0 0	400 0 0	397 0 0
Bath ..	Law 6/12	..	300 0 0	..	..	..	..	300 0 0	..
Port Antonio ..	Hurricane	2,502 0 0	..	..	..	..	..	..	..
	Law 6/12	2,600 0 0	5,102 0 0	1939	100 0 0	100 0 0	800	582 19 0	6,002 0 0	682 19 0
Central Portland ..	Hurricane	4,621 3 4	..	..					
	Law 6/12	3,948 4 0	8,119 7 4	..	..	..	1,700	1,333 18 5	9,819 7 4	1,333 18 5
East Portland ..	..	..	..	1937	200 0 0	100 0 0	700	688 9 10	900 0 0	788 9 10
St. George ..	Hurricane	1,458 0 0	..	..					
	Law 6/12	350 0 0	1,808 0 0	..	..	..	700	610 10 0	2,508 0 0	610 10 0
Long Bay ..	Do.	..	950 0 0	1936	100 0 0	83 2 11	..	..	..	..
Metcalfe ..	Hurricane	4,833 8 7	..	1939	70 0 0	70 0 0	700	598 13 2	1,820 0 0	751 16 1
	Law 6/12	400 0 0	5,233 8 7	..	..	..	..	..	5,233 8 7	..
Port Maria ..	Hurricane	9,544 0 0	..	1923	800 0 0	100 0 0				
	Law 6/12	459 8 0	10,003 5 0	1939	500 0 0	500 0 0	800	717 18 6	12,103 5 0	1,317 18 6
Southern St. Mary ..	Hurricane	..	3,814 18 2	1931	1,000 0 0	674 0 0	350	330 0 0	5,164 18 2	1,004 0 0
Richmond ..	Do.	8,717 0 0	..	..						
	Law 6/12	437 0 0	9,154 0 0	..	..	..	..	..	9,154 0 0	..
Western St. Mary ..	Hurricane	10,051 0 0	..	..	..	..	..	..	..	..
	Law 6/12	7,400 0 0	17,451 0 0	..	..	..	2,525	2,419 3 8	19,976 0 0	2,419 3 8
Central St. Mary ..	..	..	..	..	..	..	3,000	2,792 0 6	3,000 0 0	2,792 0 6
Eastern St. Mary ..	..	..	..	..	..	..	1,000	883 0 0	1,000 0 0	883 0 0
Northern St. Mary	..	..	..	1939	100 0 0	100 0 0				
			..	1939	60 0 0	60 0 0	925	777 13 7	1,085 0 0	937 13 7
Guy's Hill-Carron Hall	Hurricane	595 0 0	..	..						
	Law 6/12	1,150 0 0	1,745 0 0	1937	200 0 0	130 0 0	650	650 0 0	2,595 0 0	780 0 0
Alexandria ..	Hurricane	1,160 0 0	..	1937	200 0 0	40 0 0	..			
				1936	150 0 0	50 0 0				
	Law 6/12	1,975 0 0	3,135 0 0	1939	100 0 0	100 0 0				
				1939	100 0 0	100 0 0				
				1939	100 0 0	100 0 0	100	99 10 0	3,885 0 0	489 10 0
Eastern St. Ann ..	Do.	..	200 0 0	1940	400 0 0	400 0 0	400	373 10 8	1,000 0 0	773 10 8
Watt Town ..	Do.	..	..	1939	300 0 0	260 0 0	..	..	..	..
				1939	25 0 0	25 0 0	..	..	325 0 0	285 0 0

| | | |

APPENDIX NO. 3.

CENTRAL LANDS ADVISORY BOARD.

P.O. Box No. 127,
Kingston, Jamaica,
29th January, 1937.

No. 41/1937.

Annual Report, 1936, Central Lands Advisory Board.

Sir,

In accordance with instructions contained in C.S.O. letter No. 3418/33, dated 5th May, 1933, the newly constituted Central Lands Advisory Board has the honour to submit the following report of the proceedings for the year ended 31st December, 1936.

The reconstituted Board comprised the following Members:—

The Hon. A. C. Barnes, C.M.G., Chairman.
The Hon. Sir Thomas Roxburgh, Kt., C.M.G.
The Hon. Sir Charles Doorly, Kt., C.B.E.
Mr. A. E. Muschett.
Mr. D. J. Verity.
Mr. E. L. Jack.

2. The first meeting was held at Headquarter's House on the 18th May, 1936, at which all the Members were present. Mr. P. Martin Cooper, Acting Surveyor General, attended by invitation.

3. Mr. D. C. Mais, Accountant and First Class Clerk of the Lands Department, was appointed Secretary to the Board and assumed his duties on the 15th June, 1936.

4. Fifteen meetings were held during the year. The details of attendance by Members are given below:

Chairman	14
Sir Thomas Roxburgh, Kt., C.M.G.	12
Sir Charles Doorly, Kt., C.B.E.	13
Mr. A. E. Muschett	2
Mr. D. J. Verity	8
Mr. E. L. Jack	15

Mr. A. E. Muschett and Mr. D. J. Verity were absent from the Island during part of the year.

5. The Board has proceeded in accordance with the terms of reference published in the Jamaica Gazette of 7th May, 1936, Order No. 314, a copy of which is attached.

6. Forty-six properties in various parts of the Island offered for purchase by Government for Land Settlement purposes were considered and eight recommended for purchase.

Approval for the purchase of the following properties was given by the Legislative Council:—

Name of Property.	Parish.	Area Acres.	Price Recommended.
Buckingham	St. Thomas	721	£2,163 0 0
Brokenhurst	Manchester	500	1,600 0 0
Charlton	St. Catherine	2,206	7,000 0 0
Queen Hythe	St. Ann	1,196	4,500 0 0
Dromilly	Trelawny	821	3,200 0 0

7. The following other properties were purchased during the year:—

New Forest, St. Elizabeth. This property was recommended by the former Board and the purchase concluded in 1936.

Chepstowe—Portland. The cost of acquisition was met from General Revenue.

8. The policy of the Board has been to investigate thoroughly the demand for land in each area where properties have been offered for sale, and to obtain reports on the agricultural suitability of the soil. Whenever necessary independent valuations have been ordered; during the year seven such valuations were obtained.

The Board has also recommended to Government and obtained authority for the establishment of Demonstration Plots on Land Settlement properties purchased. The first of these has been established at Chepstowe in the parish of Portland.

The Board continues to investigate the need for new Land Settlements in Districts of the Island not already provided for and to consider proposals for developing the new properties recently purchased.

9. The Board has advised the Government in regard to numerous other matters including:—

(1) The settlement of Ex-soldiers on Land Settlements.
(2) Land Settlement for Members of the Ex-Constables Relief Association.
(3) Land Settlement for Ex-West India Regiment Soldiers.
(4) Relief of unemployment by way of Land Settlements, particular reference being made to the Unemployment Commission's Report.
(5) The Lands Commission's Report affecting existing Land Settlements.
(6) Revision of Rules for Sale of Lands.
(7) Agricultural Instruction and Supervision.
(8) Methods of dealing with reserved lands.
(9) Provision of roads for Land Settlements.

10. The Board records its appreciation of the co-operation of the Lands and Agricultural Departments, the officers of which have furnished reports on the demand for land and the agricultural suitability of the properties considered by the Board.

11. The Board desires to place on record its high appreciation of the valuable services rendered by the Secretary.

12. The expenses of the Board from the date of the appointment up to 31st December, 1936, amounted to £93 1s. 3d.

I have the honour to be,

Sir,

Your obedient servant,

(Sgd.) A. C. Barnes,
Chairman, Central Lands Advisory Board.

The Honourable
The Colonial Secretary,
Kingston.

The Jamaica Gazette.

No. 314.—The following gentlemen have been appointed to be Members of the Central Lands Advisory Board in place of the former Board:—

The Director of Agriculture, Chairman.
The Honourable Sir Thomas Roxburgh, Kt., C.M.G.
The Honourable Sir Charles Doorly, Kt., C.B.E.
Mr. A. E. Muschett.
Mr. D. J. Verity
Mr. E. L. Jack.

The Board's functions will be purely advisory and its terms of reference have been provisionally fixed to be as follows:—

1. To advise Government as to particular areas which are in urgent need of Land Settlement, and to make recommendations as to the best means of satisfying such demand.
2. To examine proposals referred by Government to purchase properties and after investigation to make recommendations as to purchase or otherwise, including the price of acquisition.
3. To enquire into the cost of development of Land Settlements, and the prices at which land is sold to settlers and to advise Government as to any amendments which may be considered necessary to improve conditions.
4. To advise as to the reservation or disposal of Crown Lands including Reserve Forests.
5. To advise on any other matters connected with Land Settlements—Crown Lands or Forest Reserve referred to the Board by Government.

The appointment of the former Central Lands Advisory Board has been revoked.

APPENDIX NO. 4.

CITRUS DEVELOPMENT LOAN BOARD.

Report for Financial Year ending March 31st, 1937.

1. The membership of the Board has continued unchanged during the period under review and consists of:—Mr. F. E. V. Smith, Plant Pathologist (Chairman), Hon. A. H. Hodges, Island Treasurer, Mr. A. B. Rennie, Crown Solicitor. During a brief period in November and December 1936, the Hon. A. C. Barnes acted as Chairman, during the absence from the Island of the Plant Pathologist.

2. Applications have continued to be received throughout the year; most of the applications, however, were received in the spring and summer of 1936, but a revival of interest recently has been noticeable. Many planters who received loans in the previous year have applied for supplementary loans to extend their cultivations. Where such action appeared justified, extensions have been granted, either completely or by instalments over two seasons. A number of new applications have also been granted by the Board. Unfortunately, due to the heavy demands upon the Government Citrus Nurseries during the 1935-36 season, there was a temporary shortage of plants available for planting during the autumn of 1936. Many of the applications which had been passed by the Board were, therefore, deferred until 1937. It is anticipated that an abundance of plants will be available during the coming season, and that there will be no further delay in establishing groves for satisfactory applicants.

3. It is noteworthy that numerous applicants proved to have inadequate titles to their lands, and except where ownership could be established by satisfactory statutory declarations, such applications had to be refused. Loans have been granted to owners of mortgaged property, only when the consent of mortgagees has been obtained.

4. The Scheme provides for an initial advance of £5 per acre in the first year, for the purpose of preparing the land and planting. In addition to this, the necessary plants, usually amounting to a value of approximately £3 5s. per acre, are supplied and charged for in the form of an advance. It has been found more satisfactory to pay the first advance of £5 per acre, in two equal instalments, a Progress Report being received from an Agricultural Officer prior to the issue of the second instalment. Maintenance advances are given at the rate of £1 per acre, in the second, third, fourth and fifth years. In addition to these advances, the Board also pays the cost of recording the necessary crop lien and this fee is charged against the applicant's account as an advance. The total commitments of the Board, therefore, in granting these loans amount to a little over £12 5s. per acre, which is recoverable with interest at 5%, by instalments from the seventh to the tenth year.

5. Since the Board commenced operation, applications have been received from 204 persons, but of this number, 18 proved to be ineligible, 12 applications were withdrawn, 28 have been refused by the Board and 53 have not been followed up by the applicants, and may be considered as withdrawn. At the end of the period under review, 49 active applications were under consideration or investigation.

6. Altogether the Board has agreed to grant loans on 44 properties to plant 313 acres in citrus and 7 supplementary loans have been granted involving a further 41 acres. In addition, the Board has promised to extend other loans for a further 35 acres if the initial plantings are made in a satisfactory manner and the assistance properly utilised. Of the original loans 2 have been subsequently withdrawn or refused so reducing the total by 15 acres.

7. The Board is, therefore, committed to advancing moneys and plants for the establishment of 374 acres of citrus groves. This will involve total advances up to March 31st, 1942, estimated at approximately £4,622, which includes £3,366 in cash advances, £41 for recording fees, and £1,215 value for plants supplied. The Board, therefore, has resources at its disposal to establish a considerably larger acreage of groves than it has yet approved.

8. A statement of the financial transactions is given in the Appendix to this Report.

(Sgd.) F. E. V. Smith,
Chairman.

Citrus Development Loan Board.

Summary of Transactions to March 31st, 1937.

Applications received	204
Disposal—	
Applications withdrawn	12
Applications refused by Board	28
Applicants ineligible	18
Inactive applications	53
In suspense and under consideration	49
Number of applicants granted loans	44*
	204

* Of this number 2 subsequently withdrawn or refused.

Details of Loans granted—

44 original loans granted to plant	313	acres
2 subsequently withdrawn or refused	15	"
	298	"
7 supplementary loans to extend by	41	"
	339	"
Additional loans promised, if first ones satisfactorily applied, to plant	35	"
	374	acres.

CITRUS DEVELOPMENT LOAN BOARD (LAW 31 OF 1935).

Summary of Financial Transactions.

Advances.	1935-36.	1936-37.	Total.
Plants issued	7,559	7,620	15,179
Value	£368 11 6	£373 10 0	£742 1 6
Recording fees for Agreements	11 19 3	17 2 9	29 2 0
Loans for preparation and planting of land ..	485 0 0	635 0 0	1,120 0 0
Maintenance Loans	..	132 0 0	132 0 0
Total Value Advances	£865 10 9	£1,157 12 9	£2,023 3 6
Interest accrued on loans	13 7 6	81 1 0	94 8 6
Expenses of Board for inspection, etc. ..	53 11 10	31 9 2	85 1 0

F. E. V. SMITH,
Chairman, Citrus Development Loan Board.
April 5th, 1937.

Certified correct, subject to the inspection of one agreement, and the satisfactory settlement of queries issued.

(Sgd.) J. L. WORLLEDGE,
Auditor General.
21st April, 1937.

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